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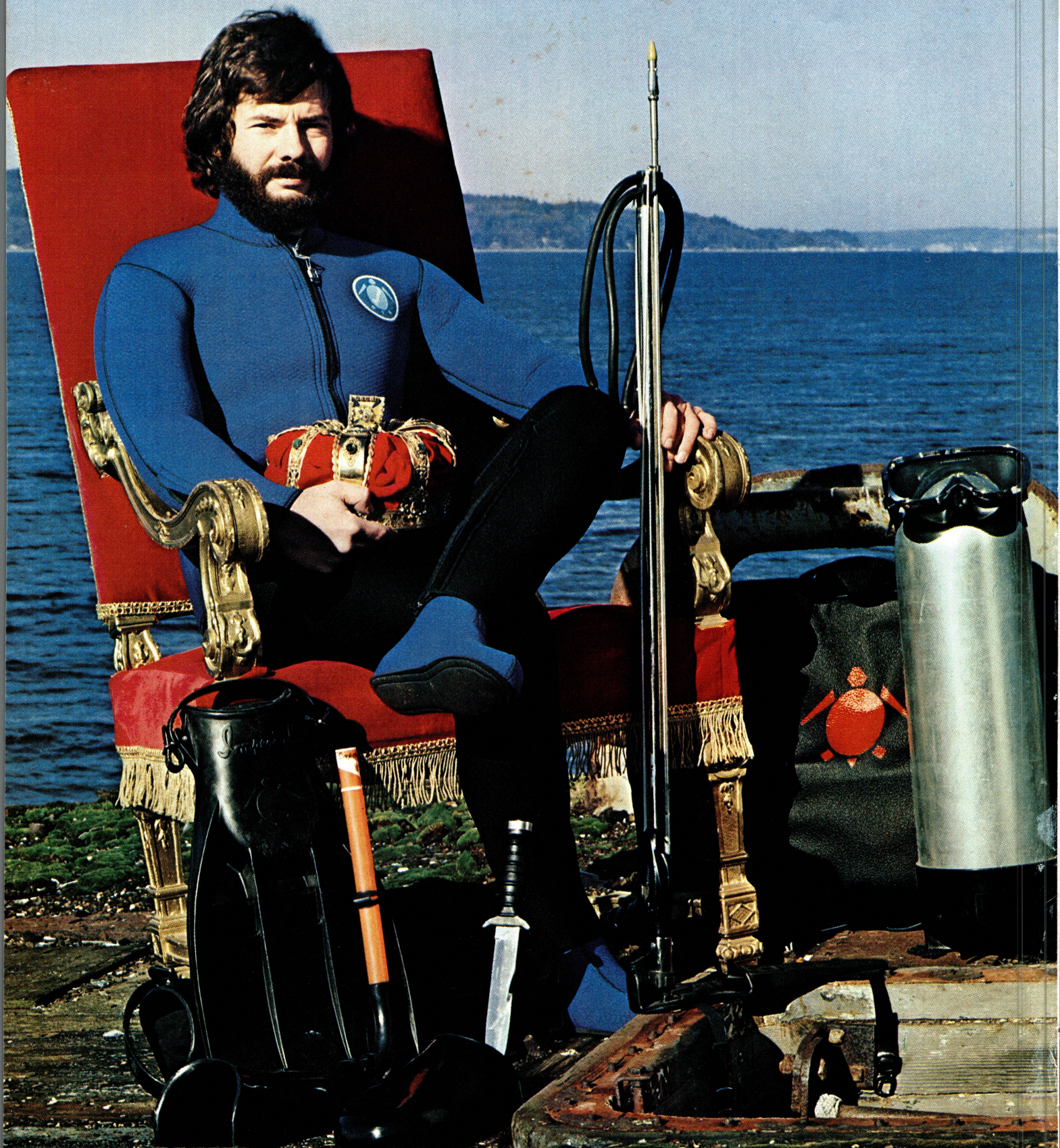
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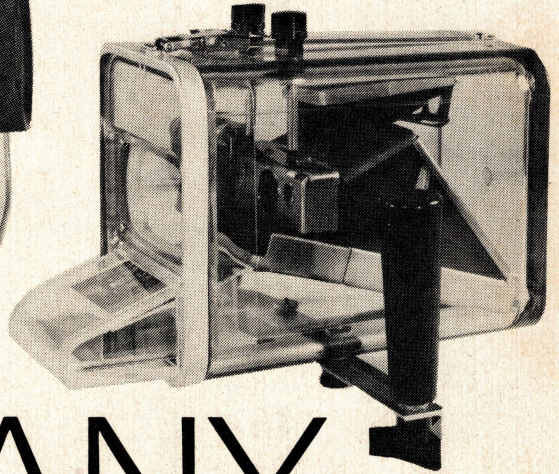
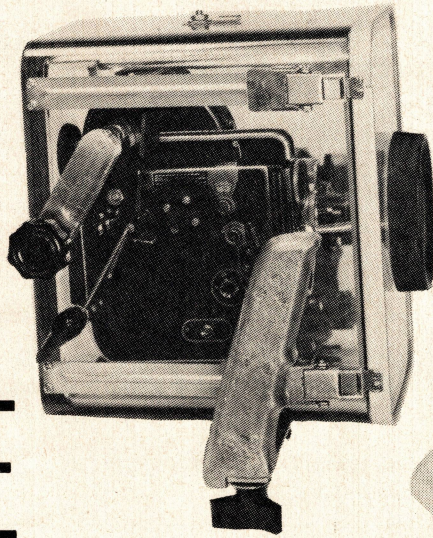
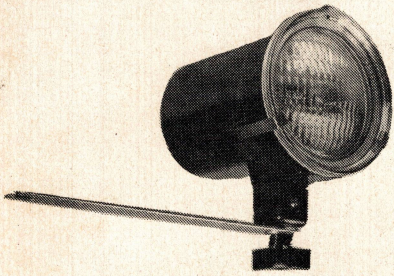




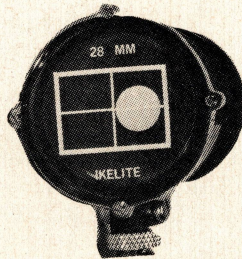
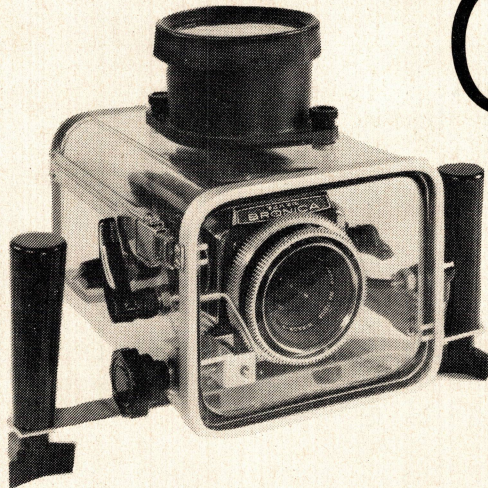
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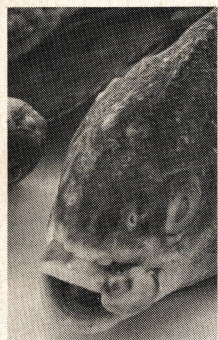
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48/Nice Boy



34/Help!



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Cover – Ron McComber, founder of Club Manukai on Lanai, delights visiting U/W photographers with rare undersea subjects such as this octopus. An expert on the reefs and creatures of Lanai, Ron has located and surveyed at least 60 dive spots near his island resort. The photograph was taken by Paul Tzimoulis.

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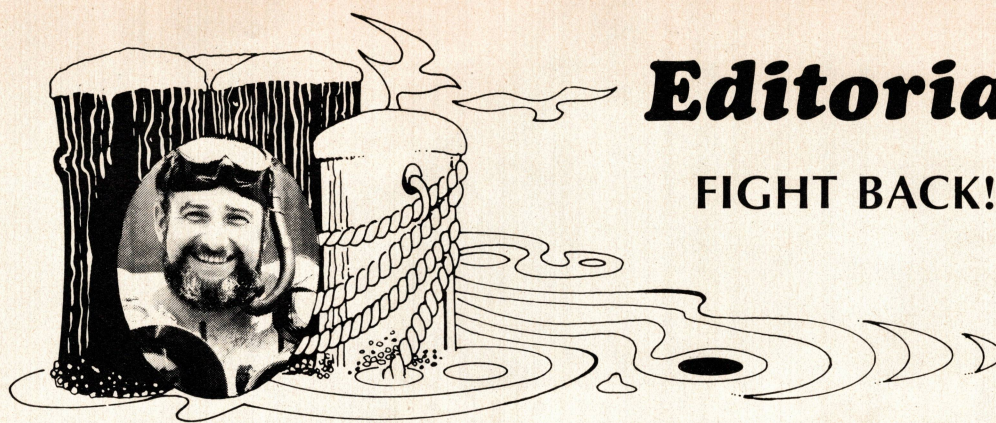
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Editorial

FIGHT BACK!

by the Publisher

The divers of Los Angeles County are hopping mad . . . and understandably so. They have stood by helplessly while their freedom to dive evaporated almost overnight. They watched with disbelief as sensationalistic newspaper stories unjustly branded their beloved sport as "unsafe and out of control." And they were dumbstruck when a poorly informed, totally insensitive government machine railroaded through a hodgepodge of unrealistic, costly regulations in an almost dictatorial fashion.

Many divers still cannot believe that it actually happened. Sport diving is one of the few leisure time activities that is well organized with a self-regulating program for training and certification. The safety record has grown better over the past four years, not worse. According to Jon Hardy, General Manager of NAUI, a study of the records from 1970 to 1973 shows that the number of trained divers has increased by 137 percent, while the number of fatalities has only gone up 4 percent. These are statistics to be proud of, and certainly no reason or justification for legislative controls. Yet here we are in 1975 laboring under the yoke of government red tape and legalistic control — our personal rights and freedom to dive perhaps lost forever.

Reaction to the County Scuba Diving Ordinance has ranged the full spectrum from passive disgust to absolute outrage. Never has the diving community felt so frustrated, yet so helpless in fighting back. The less dedicated divers are simply quitting — giving up diving, and seeking less complicated sports like golf, tennis, or sailing. There are no laws or certifications encumbering these outdoor activities.

Irate over this government encroach-

ment upon their personal liberties, many divers are boycotting L.A. County waters — driving long distances to Santa Barbara or San Diego for their weekend diving excursions. One old time diver vowed, "I'd rather drive all the way to Mexico than submit to this county recertification nonsense."

Meanwhile, dive shop sales and dive boat charters in the L.A. County area continue their downward slump as the public recoils badly from this government take-over. The majority of divers are upset, disgusted, and unsure of what to do next. They are secretly hoping "someone" or "some organization" is going to magically appear and rectify this great injustice which has been done by the county government.

The truth of the matter is that there is no "Savior" — no "special organization" which is going to get us out of this jam. Many have tried and failed. Several of the leaders of the sport diving community tried to bargain with the politicians, and ended up getting "conned." The diving equipment manufacturers attempted to voice a strong protest, but their words fell upon deaf ears. The diving accident statisticians presented their compiled data on the safety record for diving, but these arguments were also met with stoney silence and indifference.

Let's face it — the only one who can help get us out of this mess is you, the individual diver. Politicians and government officials can remain immovable and indifferent to almost everything — except the will of the people. It's time for you to make your sentiments known. It's time for you to stand up and be counted. A chorus of protest from the diving public may be this sport's only salvation.

How do you do it? Very simple — sit

down today and write a letter to the County Board of Supervisors, the men who actually made the scuba ordinance a law. State clearly your personal reactions to this new law, and your arguments as to why you feel the law is unjust, unrealistic, unworkable, ineffective, or whatever you think. Address your comments to: Honorable James A. Hayes, Chairman, Board of Supervisors, Hall of Administration, Room 822, 500 West Temple Street, Los Angeles, Ca. 90012. Tell them exactly how you feel about this law, demand it be repealed until further study, and request a reply to your letter. It could make all the difference in the world. Government must respond to will and sentiment of its people.

Maybe you've never written a letter like this before. Don't feel alone, there are thousands of other divers in the same boat. Maybe that's why the sport is in so much trouble with the legislators. It's a good time to start, for this ordinance is a clear-cut case of injustice.

And you might as well get used to writing letters like this. There will be many more occasions in the future. At this very moment, other counties in Southern California are considering restrictive diving legislation similar to Los Angeles. The State of California is also investigating the situation — as is the State of Florida, the State of New York, and others. Each one will be a difficult battle, requiring the united strength of the entire diving community.

The sport of diving may very well be fighting for its very survival during the next two years. This is why it is so important for you to become personally involved. If you really care about diving, put it down in words, write that protest letter today. The battle has begun.



... Bill Barada's article, "Can Safety Be Legislated?", reflects a problem which people in every walk of life are encountering all too frequently with each passing year. Government at all levels is obviously trying to assume a big brother role and guide our destiny through an untroubled sea of life. Wherever bureaucracy finds what it thinks to be a problem, some primeval decerebrate instinct is triggered and the gears of the bureaucratic machine activated. As Mr. Barada has noted, such interference does not necessarily mean that a correct course of action will be taken, that enough fact finding has been done to outline a proper course of action or that the problem has even been identified correctly. As a physician, I can sympathize with the situation which has developed in California. In my profession we have been under tremendous scrutiny and legislative attack, and by many of the same types and caliber of bureaucratic minds that scuba diving interests will have to contend with. We Medicos have slowly begun to realize that nothing takes the place of educating our bureaucratic friends about the problem, all the facts involved, and sensible remedies to be taken. The media must be used to keep the debate a dialogue and not an administrative monologue.

PATRICK D. SULLIVAN, M.D.

WINTER HAVEN, FLA.

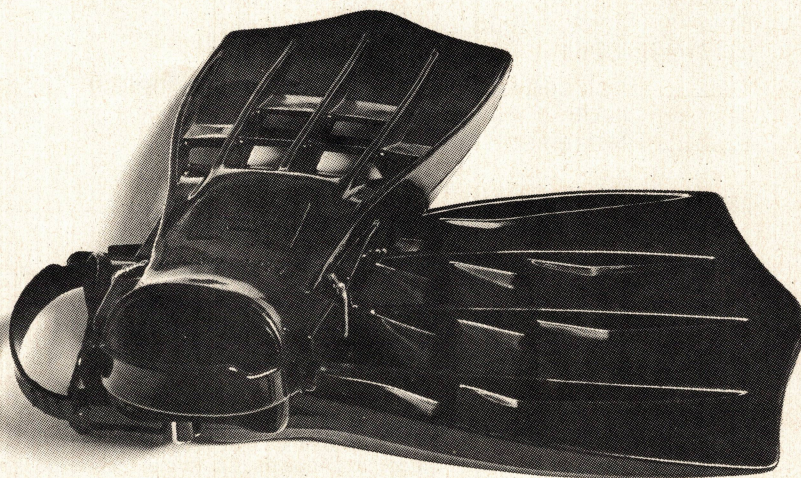
... Your editorials in the December '74 and January '75 issues show a trend toward restrictive legislation that should alarm any skin or scuba diver. Those of us that are familiar with bureaucratic proceedings know that what seems to be exaggerations of the present become realities of the future. This is of course only if allowed to propagate unchallenged or unchecked ...

CHARLES BUNCZK

NORRISTOWN, PENNA.

... That was a fine article about sharks in the January issue. We are learning a great deal about sharks but we still have a long way to go before we will fully understand them (if ever). I personally regard them as unpredictable. Like humans and animals, everyone is a little different. There is no way to predict positively what a shark will do when a diver enters the water with it. Most likely it will flee the scene, especially if there are several divers and only one shark but when a lone diver meets a shark, the shark is not so inclined to flee in panic.

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I note that most of the shark research is done with teams of divers and very little is done with the researcher facing the shark all alone in the open sea . . . I would like to hear of research or observations of a lone diver or swimmer who is confronted with sharks. My own opinion is that sharks are much more curious and threatening to a lone diver . . .

I will agree one hundred percent that the best thing to do if a shark approaches in an attack is to turn and face the shark . . . One thing that I have done over the years to guard against sharks, is that I turn completely around each time I surface from a snorkel dive so that I can see if a shark is trying to sneak up on me. They do just that and more than once I have turned to see a shark approaching, only to have it swim rapidly away when it knows I have seen it.

Something else which I have noted is that sharks seem to make a definite noise, like a dull outboard motor when they are traveling at high speed. It can only be heard when the seas are flat calm and quiet . . . I would be interested to hear if any other divers have heard this noise. It seems that the sharks make it with their caudal fin rapidly chopping the water when they are swimming at top speed.

ROBERT P.L. STRAUGHAN

CORAL REEF EXHIBITS

BOX 1000 BELLEVIEW, FLA.

. . . Having watched his TV series in England many years ago and later diving with him in Port Royal, Jamaica, I became an admirer of Dr. Hans Hass and his work. However, his article, "A Process We Call Evolution," in SDM December, 1974, I feel, rather misses the point concerning spearfishing.

Dr. Hass states that mechanical spear-guns are mainly responsible for the extermination of fish and therefore advocates a ban on them whilst permitting the use of hand spears.

In Jamaica, an example cited, if mechanical guns were banned, the following would probably occur: 1) divers would use hand spears and gradually become proficient with them, 2) even assuming a lower killing rate with a hand spear, the poor Jamaican fisherman will stay out in the warm water an hour or so longer until he has obtained the same catch that he would have obtained with his mechanical gun, 3) more fish traps would be used, 4) some fishermen would turn to dynamiting. In short, the fish would be killed by other methods.

What is needed in Jamaica and possibly elsewhere is a total approach to the problem by the responsible authorities.

Action must be taken to preserve the marine environment not only by controlling spearfishing but all types of fishing. Seasons must be introduced, size limits established, etc., and these must be vigorously enforced. Control must also be exercised over industry, land developers, and local authorities to prevent destruction by pollution, etc. Education must play its part. For example, ignorant fishermen using small mesh pots must be shown that they are in effect cutting their own throats.

What I personally would like to see is that commercial fishermen either turn to mariculture or fish the oceans and leave the beautiful reef fish for all to see and enjoy. For those who must spearfish for fun, I would suggest they stock lakes, etc., and breed fish for this purpose.

Surely our reef fish have a value apart from food. Is man on this planet just to survive and reproduce and have his belly full? Aren't there other things in life? What of beauty?

DAVID J. HEATH

MONTEGO BAY, JAMAICA

... It is my opinion that the basic scuba certificate is far too easy to obtain in too many cases.

Having observed a great variety of divers in North Florida and now that I am a resident of the Florida Keys, I have run across a spectrum of scuba divers. Having seen too many less-than-competent divers, I feel it is about time that the entire certificate granting system be given a comprehensive shakedown. The minimum standards for the basic scuba certificate examined and I believe stiffened, in order to protect those individuals who honestly believe that they are competent scuba divers. The seriousness of the potential hazards of the sport need to be stressed more heavily as well as the necessity of good physical conditioning.

I believe that scuba instructors, who are actively teaching, should be reviewed on a regular basis. Ideally, all scuba instructors should possess the conviction that my instructor had in feeling responsible for his students even after they were long gone. Perhaps if the scuba education system was given a reasonable shakedown and the minimum requirements re-examined, then hopefully we could eliminate a large percentage of the accidents which mar the sport that so many respect and enjoy so much.

TOM CORYN KEY LARGO, FLA.

... I would like to offer a different perspective to the argument over dietary vitamin/mineral supplements.

First, I do feel that in some segments of our society vitamin/mineral deficiencies do exist ... Second, a vitamin/mineral deficiency can and should only be diagnosed by a competent medical professional and not by the individual at home, and no untrained individual should ever



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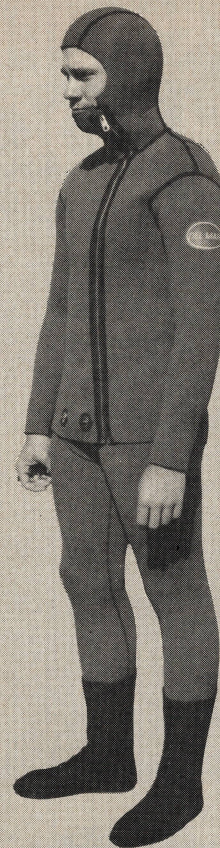
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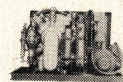


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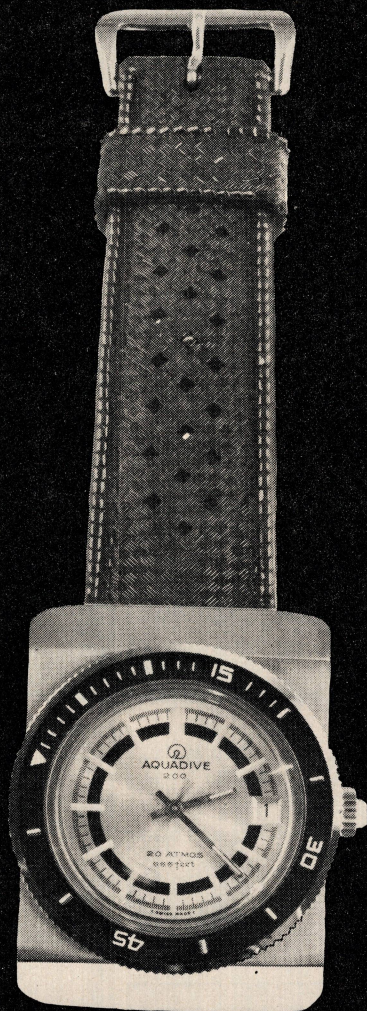
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undertake the task of prescribing any "medication." Third, it is my belief that "pills" provide only a temporary relief for any problem, including a vitamin/mineral deficiency, and that if the problem is to be cured in the long run it should involve educating the individual in the area of good nutrition and providing this person with the means of obtaining a balanced diet which meets his needs.

With these concepts in mind it is my contention that if divers really do have "unique" dietary needs then I feel that divers should be educated to this fact and should be provided dietary guidance concerning ways to avoid these deficiencies. Finally, it is my firm personal belief that by promoting the use of these "dietary wonders" we are aiding a more serious problem, that of overdependence on pills of all kinds as a cure-all for problems both real and imaginary.

It is my hope that divers are intelligent enough to follow sound medical advice concerning their diet and not return to the archaic practice of self medical treatment utilizing over-the-counter products.

JOSEPH M. PERRY, JR.
AQUATICS DIRECTOR

PITTSBURGH, PENNA.
YMCA & PADI INSTRUCTOR

... An article in your December issue, entitled, "Where Scorpion Lies," graphically points out the need for diver education in first aid. It also illustrates the lack of information and training in the treatment of venomous marine animal injuries by medical and paramedical personnel. This becomes particularly apparent when medical personnel in a seaside hospital do not have any idea as to what action to take in the case of a scorpionfish sting.

The article does not point out that with simple first aid treatment, applied immediately, the patient would more than likely not have gone into shock and the after-effects of the stinging incident would not have been as severe ... The basic first aid in venomous fish stings, as practiced by most public aquariums, is to place the injured part of the body in hot water, as hot as the patient can stand it, and then get him to the nearest hospital ... Once the patient is at the hospital, qualified medical personnel can provide follow-up treatment.

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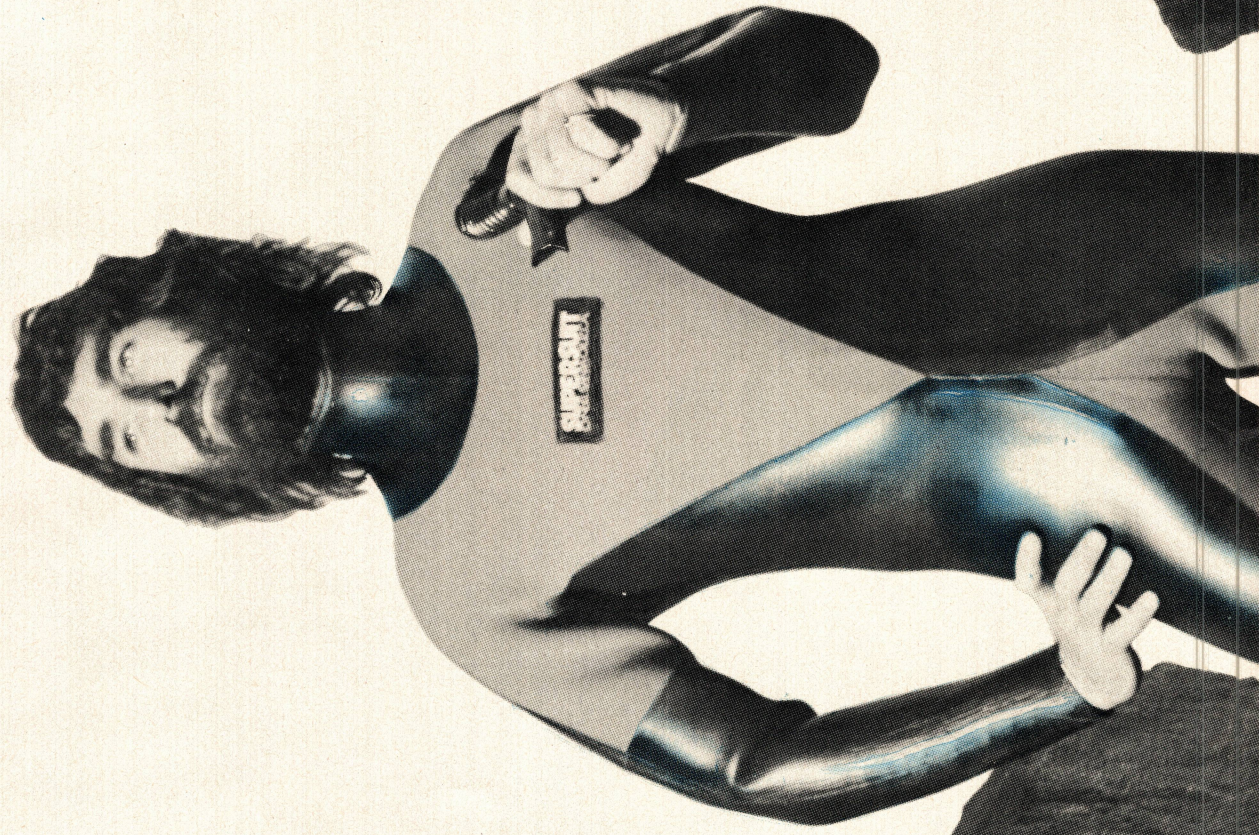
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April 5

Underwater Symposium & Film Review. Symposium, Harvard University, Cambridge, 11 a.m.; film review, John Hancock Hall, Boston, 8 p.m. (Contact: Fred Calhoun, P.O. Box 291, Back Bay Annex, Boston, Mass. 02117)

April 12

Inner Space '75, Southeastern Mass. University, North Dartmouth, Mass. Seminars, 10 a.m.; film exposition, 7 p.m. (Contact: C. Driscoll, 119 Howard Ave., New Bedford, MA 02745)

April 13

Tacoma Scubaneer's 16th Annual U/W Treasure Hunt. (Contact: Dennis Putnam, 7731 182nd Ave. E, Sumner, Wash.)

June 13-15

New York State Divers Assoc. Convention, Lake Placid. (Contact: Gary Brandstetter, 45 Algonquin Dr., Plattsburgh, N.Y. 12901)

June 21-27

CEDAM International Annual Meeting & Symposium, Akumal. (Contact: CEDAM International, 5820 Burning Tree Dr., El Paso, Texas 79912)

July 6-18

6th Symposium on Underwater Physiology, Hotel del Coronado, San Diego. Jan. 31, 1975, deadline for receipt of contributed abstracts. (Contact: Secretariat, Vith Symposium on Underwater Physiology, 9650 Rockville Pike, Room 200, Bethesda, Md. 20014)

August 2-3

15th Top of Michigan Aqua Thon, Duncan Bay, Lake Huron, 10 a.m. (Contact: Dick Charboneau, R#2, Box 610-M33, Cheboygan, Mich. 49721)

August 10-17

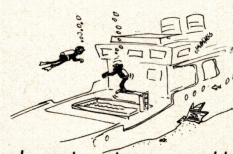
British Virgin Island Film Festival. (Contact: George Marler, Box 108, Road Town, Tortola, B.V.I.)

September 26-28

NAUI 7th International Conference on Underwater Education, Miami, Fla. (Contact: NAUI Hdqrs., 22809 Barton Rd., Colton (Grand Terrace), Calif. 92324)

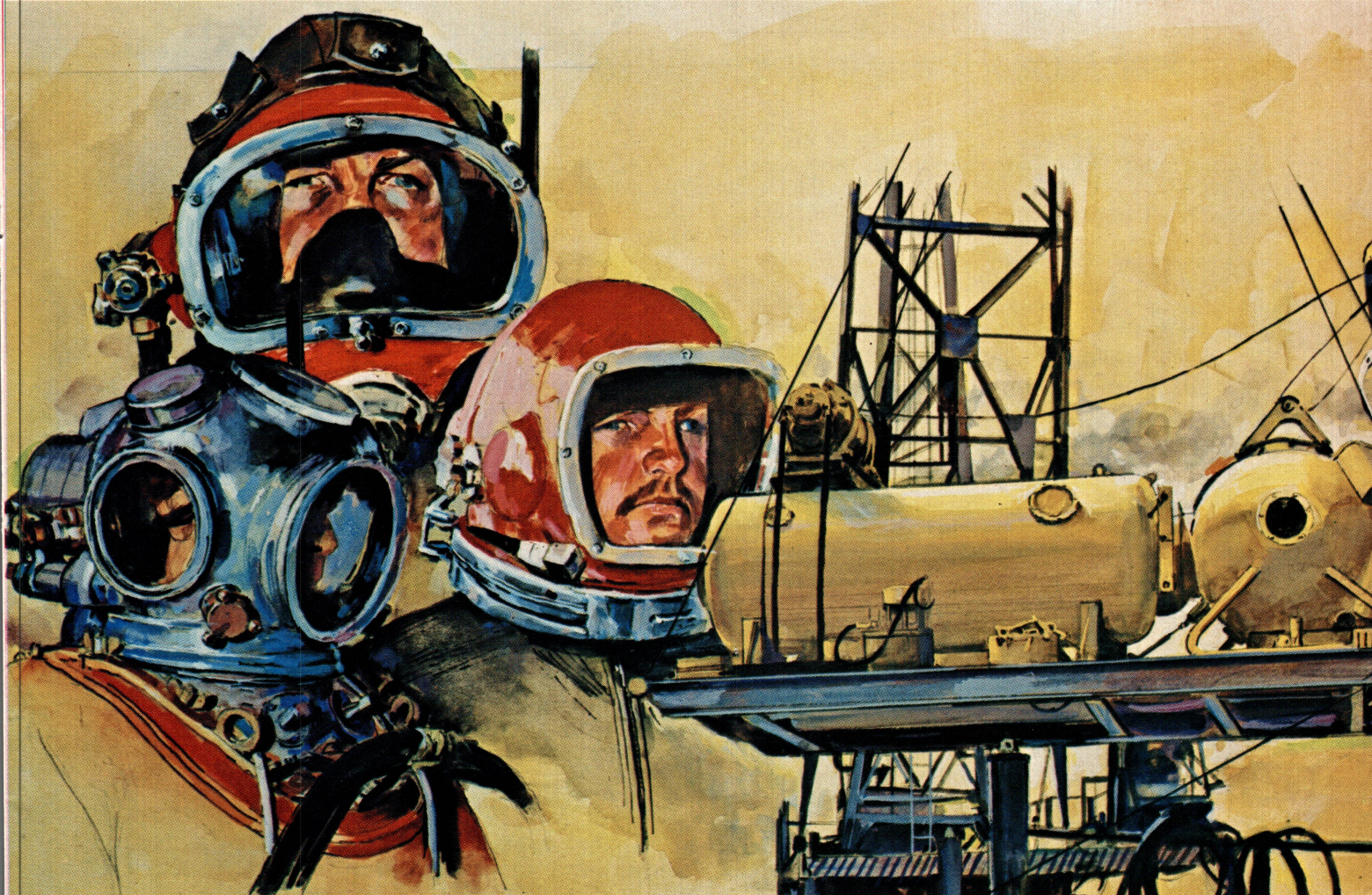
October 4-5

North Atlantic Underwater Convention, Rockport, Mass. (Contact: J. Burrage, 74 E. Main St., Hopkinton, Mass. 01748)



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An interview with: **Ed Brawley** President of **Professional Diving Instructor College.**

Parkway: Why did you start the Professional Diving Instructor College?

Brawley: It became apparent to me in 1969, after teaching and working in diving for many years, that none of the accepted training programs were producing professionals who could function in every facet of the diving industry.

Parkway: Are you implying that other courses don't do an adequate job of training divers?

Brawley: Not at all. They just don't go far enough to create truly professional full-time career instructors...and, I've never heard them claim to do so. That simply isn't their function.

Parkway: How is P.D.I.C. different from other certification courses?

Brawley: P.D.I.C. is an approved vocational college training for full-time careers. We also train professional educators to teach diving in schools, have a course for shop owners and managers, and open water courses for all instructors. We're concerned with education, not just diving ability.

Parkway: Do you supply equipment for your college students?

Brawley: Some. The students in the 12-week Professional Diving Instructor Course must supply their own masks, fins, snorkels, boots and gloves. We provide

scuba, shark-skin two wet suits and all special equipment.

Each certified graduate receives the P.D.I.C. *Instructor Guide* and a set of 60 instructional slides. Then they have continued access to our library and revisions of material. We also provide recommendations to employers and assist with job placement guidance.

Parkway: Why do you provide shark-skin two suits?

Brawley: Because they've proven durable by standing up to the really hard use we put them to in our intensive training program. Also, they fit most students so well that we avoid custom suit costs. Shark-skin two suits give our students a freedom of movement that makes learning easier.

Parkway: What are the requirements for enrollment at P.D.I.C.?

Brawley: Requirements differ for each course. However, all applicants must have a high school education or equivalent, basic diving ability, be at least 18, and pass the physical examination. There's one more requirement. Applicants should enjoy diving and want a stimulating, exciting and rewarding career!

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INNER SPACE '75 BY CORNELIUS DRISCOLL

On April 12th, the Inner Space Society of Southeastern Massachusetts University presents its second annual underwater seminars and film exposition on their North Dartmouth, Massachusetts, campus. Promising to be one of the greatest symposiums in history, the guest list for Inner Space '75 reads like Who's Who in Diving! Attending will be Paul Tzimoulis of SKIN DIVER, Dr. Joe MacInnis, Al Giddings, Lee Tepley, Ernie Brooks II, Stan Waterman and Dr. Harold Edgerton, to name just a few.

The format for Inner Space '75 will



consist of simultaneous daytime seminars, to be followed by a celebrity-packed, nighttime film exposition, with Paul Tzimoulis emceeing the festivities.

Gracing the daytime stage will be Paul Tzimoulis on underwater photography, Dave Owen on deep-sea photography, George and Betty Tomasi on Lake Superior wreck and ice diving, Richard B. Stone on artificial reefs, Houston Childers on his home study course for commercial diving, John McNiff on the workings of the University of Rhode Island's National Underwater Accident Data Center, and many, many more.

Seminars on Block Island diving, Revolutionary War shipwrecks in New England, Alex Byron's attempt to raise the sunken whaling ship *Ansel Gibbs*, marine taxidermy, commercial diving, underwater archaeology, lobster management studies of the Federal Lobster Scientific Committee, shark attacks, diving medicine, cardiopulmonary resuscitation, ice diving, and collecting marine specimens will also be presented.

Mark V. Benson, the first recipient of the Our World — Underwater scholarship will present a film narrative of his diving expeditions around the world.

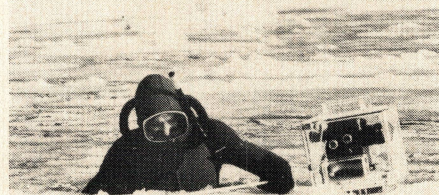


Demonstrations of the UDS-1, the Unisuit, the Hot-Water Suit, the Divator, the Zip-On Suit, the At-Pac, and others will be performed. A Conshelf Arctic regulator has been donated by Tony Bruno, of U.S. Divers, Co., to be awarded as a door prize. Other manufacturers being represented will be Parkways, Seatec, Dacor, Watergill, and others.

Arctic photos by George Roy



Dr. Joseph MacInnis, Undersea Research Ltd., Toronto, Canada, will capsuleize his four consecutive Arctic expeditions, in which he, and his men, braved



temperatures averaging 45 degrees below zero. His film promises to boggle the mind with its unique focusing on the strange forms of Arctic life.

Al Giddings, Sea Films, San Francisco, will premiere his new film, *Sea of Eden*, on the east coast. Lee Tepley will be on hand to present his award-winning film, *Fire Under the Sea*, an underwater documentation of the first, and subsequent, expeditions in which scuba divers viewed active lava flows underwater. Ernie Brooks II, president, Brooks Institute of Photography, Santa Barbara, will give his multi-media presentation of his expeditions to Arctic and Truk Lagoon.

Also gracing the nighttime stage with their their film exploits will be Paul Tzimoulis and Stan Waterman.

The daytime seminars will begin sharply at 10 a.m., and the nighttime entertainment will begin at 7 p.m. Tickets for the day and nighttime events are \$5.00, and \$4.00, respectively. Advanced tickets for the combined shows are \$8.00. For further information contact: Cornelius Driscoll, Chairman, 119 Howard Ave., New Bedford, Ma. 02745.

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viction of the murderer. On the second day of the intensive search, Apolonio made two dives to a depth of 150 feet using double tank units. Inadequate surface interval and inadequate decompression followed the dives and Apolonio was stricken with the bends. Severe cramps and excruciating pain developed within ten minutes after he surfaced. He was placed in a portable recompression chamber at 10 a.m. on March 10. Symptoms were relieved and,



mistakenly thinking the bends were cured, Apolonio was released from the chamber. Even more severe symptoms of bends recurred. He was again placed in the chamber, but for many reasons he was not adequately treated and was released. At 8 p.m. Apolonio was again placed in the chamber but this time failed to respond to treatment. At 3 a.m. on March 11, 1957, Apolonio was failing rapidly and he was removed from the chamber and taken to the Naval Base at Icosos where he died at 7:55 a.m.

On March 11, 1973, on the anniversary of his death, I visited Acapulco where a swimming meet honoring the memory of Apolonio was being held for the youth of Mexico. After the meet I visited the Mexican Navy diving school which Apolonio helped establish. In a place of honor was a commemorative photo with an inscription exalting "Capitan Apolonio Castillo Diaz."

Later that evening, in the dive shop Sirocco, I ran a copy of "Spearfishing in Mexico" for a small gathering of special friends of Apolonio. There were many tear-filled eyes in the small audience. The film ends with Apolonio on the beach after a day of spearfishing, drinking a toast to the divers of the world from a dripping coconut.

On this evening, vibrant with life, the film was presented to the swimmers, divers, and people of Mexico, to help perpetuate the memory of Apolonio and the pride he had in his country and his chosen profession.

Additional comments or information about personalities in BIOBRIEF's will be welcomed as possible follow-up material. Also let us know about other divers, past or present, men or women, whom you feel should receive brief recognition for their diving exploits or contribution.

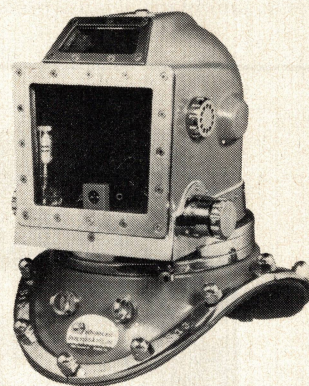
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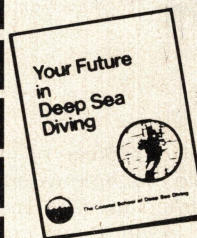
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SD 45

HANNES KELLER...

MAN BEFORE HIS TIME

On December 3, 1962, Hannes Keller, a young Swiss mathematician, stepped out of the diving bell Atlantis and swam around at the fantastic depth of 1020 feet off Catalina Island, California. With him in the chamber was British photo-journalist Peter Small, and on the surface was an anxious crew that watched through closed circuit television what was happening in the depths below. Also on the ship was Dr. Albert Buehlman, a University of Zurich medical professor who specializes in lung function and blood circulation. Buehlman had worked with Keller to develop deep diving methods and together they had masterminded the idea of alternating gases to shorten decompression time. Buehlmann had supported Keller as medical advisor during his early dives in Europe, and the 1000 foot dive was to put their theories to the ultimate test.

Sadly, the experiment ended in tragedy. Keller was only out of the chamber for two minutes, trying to plant a Swiss flag on the ocean bottom, when he began to feel dizzy. Realizing that he was running out of helium-oxy mix in his breathing apparatus, he returned to the air-filled chamber and immediately gave the signal for an emergency ascent. Then he opened his face mask breathing air now and lost consciousness. Peter Small had been instructed to open his face mask as well, but when he saw Keller pass out it is speculated that he became paralyzed with fear. The shouts from the surface through the telephone didn't seem to shake him, and eventually Small passed out. As the chamber was raised and pressure reduced to 150 feet, Keller still breathing the air inside, regained consciousness. He immediately opened Small's face mask and began artificial respiration, but it was too late. Small had suffered from anoxia (lack of oxygen) in the brain, and by the time he reached the hospital he was dead.

Although the entire dive was clouded in tragedy, controversy, and many unanswered questions, one thing still re-

mained: man had actually succeeded in diving to over 1000 feet. The theories of rapid compression and the alternating of gases had worked. The Keller dive stands as a monumental achievement when one considers that to date no one has surpassed that world deep diving record.

The Keller dive revolutionized all deep diving concepts. In today's oil fields the type of dive schedule that Keller tested over ten years ago is now making it possible for divers to work at greater depths. Keller has since gone on to work on the technical development of safe and efficient underwater equipment for commercial deep diving, including suits, chamber systems and decompression slide rules. Since he felt that the accidents on his 1000 foot dive were largely caused by the immobility and inefficiency of the diving suits, he set about to build a better one. About 200 new diving suits were sold worldwide, but in the end, it was converted into a ski-suit, was tested on the ski slopes of Switzerland and never got back to the water. The suits, made of a special four-way-anti-gliss stretch fabric, became the rage of winter sportsmen throughout Europe, were dubbed "Skin," and have since been adopted by international ski teams throughout the world. To date some 25,000 suits have been sold.

On all-too-rare occasions, Hannes Keller comes to the United States from his home near Zurich. During his last trip to California we were able to sit with this legendary man of the sea, to learn what has transpired in the 12 years since his record-breaking Catalina dive. Keller is the diving world's mad scientist – a delightful combination of genius and outrage. He talked about diving in the year 2001, related a few of his wild schemes in a heavily accented English punctuated with math formulae and algebraic equations, threw in a joke here and there, and in the end left us all in the dust. We found his ideas fantastic, far-out, but strangely believable – like he is.



"I built my own regulator out of a piece of wood, because I only had the tools to machine wood, not to machine metal, and I learned to dive, myself, alone. It was crazy."



"... 'If I do this, then I'm the most famous man in the world. I will get to Hollywood, I will have the nicest girls in the world, a Ferrari, everything.' I was convinced of that."

Text by Hillary Hauser — Photography by Jack McKenney

SDM: Hannes, how did you get started in diving? And what were the deep diving experiments that led up to your 1000 foot dive?

KELLER: Actually, I did some sport diving, beginning in 1958, and I immediately realized that diving was something worth pioneering, that one chap could answer the challenge with very limited means. This is not possible in the space industry, or most other industries. I felt that diving technology could be handled with a reasonable approach and that one could really do big things. So, I decided to solve the problem of deep diving.

I built my own regulator out of a piece of wood, because I only had the tools to machine wood, not to machine metal, and I learned to dive, myself, alone. It was crazy. I had something like three hours of diving experience, total, when I decided to break the world record. But then I didn't know what the world record was.

I found that in 1958 there were two records; for air diving it was roughly 430 feet, and the Royal Navy had gone to 600 feet in a simulated dive. So, O.K., I go to 1000 feet — a nice round figure. I found out that the diver Wookey of the Royal Navy needed 24 hours to come back from four minutes bottom time at 600 feet. This was ridiculous, so I set out to find a method for rapid decompression. But first I had to figure out what the decompression problems were.

SDM: How did you get together with Dr. Buehlmann? Didn't he help you with these problems?

KELLER: It was very funny. I wanted to use hydrogen, not helium, because I was looking for a cheap method. I suspected that hydrogen would chemically react and do bad things in the body, so I needed a doctor of physiology who could tell me the various reactions of hydrogen in the body. Somebody told me about Al Buehlmann, a professor of lung function at the University of Zurich Hospital. I went to him and asked him, "Well, what do you know about hydrogen in the body?" He couldn't understand at all why I wanted to use hydrogen, and I couldn't explain to him the problems of diving because I had no idea about it. He got interested in the project, and said, 'O.K., I'll help you,' and we started to work together. I knew mathematics, and he knew physiology.

SDM: What kind of equipment were you working with then?

KELLER: My very first dive I made with the cheapest diving method. For a diving bell I brought a 50 gallon gasoline drum. I paid one dollar for it, and made a diving bell out of it. I had a couple of large stones hanging on it, at the end of ropes. I kept my knife in my left hand to cut them off if necessary, and with my right I manipulated my air tanks, flowing air inside the drum. I had a couple of hand lamps, not diving lamps since I couldn't afford those, and I borrowed Aqua-Lungs from people. With that kind of equipment and a safety emergency ascent device made out of an old car tire, I went to 400 feet.

SDM: How were you feeling inside that drum?

KELLER: I was almost vomiting from fear. I was frightened to death. I was terrified, but I felt, 'If I do this, then I'm the most famous man in the world. I will get to Hollywood, I will have the nicest girls in the world, a Ferrari, everything.' I was convinced of that.

SDM: Well, you're in Hollywood now, and you have a Lamborghini and your beautiful wife beside you. Where did you go from there?

KELLER: I did a lot of development and research. I made some demonstrations for the U.S. Navy. Everybody said that I was just some sort of abnormal guy and that absolutely nobody else could do it, physiologically. So, I had to prove that it wasn't just me, that the method was good. So, I had a talk with *Life Magazine*. I met Ken MacLeish, a *Life* editor, in New York and I told him that I needed the story in *Life* to convince the U.S. Navy that a research contract with me would be a good idea.

MacLeish said, "Well, is it safe?" I said, "No, not at all; it is very dangerous. It is reasonably safe and we can do it, but there is a risk and I'm frightened." Then he said, "Now you talked me into doing it with you. Because you tell me you are frightened, that it is dangerous, I understand that you really know what you are doing. That convinces me that it is reasonable to go with you. I will come with you."

I told MacLeish that if *Life* paid me \$2000, I could do the dive and he would get the story. He bought a ticket to 700 feet and back, for \$2000, and within four weeks we constructed a new device. Ken MacLeish came and we trained him for three days and we went down to 728 feet. We made that deep dive without a chamber, without a bell. We had freezing regulators and had lots of problems. It was all right, but it was the limit for



"... Everybody said that I was just some sort of abnormal guy and that absolutely nobody else could do it, physiologically. So, I had to prove that it wasn't just me, that the method was good."



"... the moment we had it financed by Shell Oil in 1963, there was no longer a necessity for secrets. Then it was published ... There are few reading the *Journal of Applied Physiology*."

deep diving. That dive showed me that deep diving without a bell is too risky. I think that the 728 foot dive, without a chamber, is a world record which will remain for some time to come. It was crazy. One shouldn't do it again with that technology, but at that time nobody knew what deep diving really involved. If you realize that today one hour's work at 700 feet would cost approximately \$20,000 you'll see what I mean. The cheap deep diving method proved to be something impossible.

SDM: Then came your 1000 foot dive in 1962. The technical aspects of this feat has still kept the scientific community guessing, after all this time. Can you tell us about the gases you used, and something about the technique?

KELLER: Basically, we used a helium-oxygen mixture. About 97 percent helium and 3 percent oxygen. Going down we used different percentages of oxygen, nitrogen and helium, always working with the maximum of nitrogen up until extreme depths. After 600 feet I had practically no nitrogen, but up to 600 feet I used the maximum of nitrogen. I didn't do this for physiology, but for decompression. For a short dive, helium decompression is longer than for nitrogen decompression. You saturate faster.

SDM: Are commercial diving organizations such as COMEX and the U.S. Navy using a technique similar to yours, the formula you used to go to 1000 feet?

KELLER: Yes. My technique was to use helium in depth. Now that was nothing new, and there's actually no real alternative to that. Everybody is using that now. What I introduced was short decompression with a bottom time of, let's say, less than an hour at great depth. Buehlmann and I developed a new pattern for decompression, a new calculus, and we developed a trick of switching gas mixtures.

The trick was to switch at the given moment from helium to a heavy gas like nitrogen. Also, I did something which one did not understand them: it was a good thing that I was compressing with a lot of nitrogen in the mix. It has been discovered now that you can compress much more rapidly with nitrogen. Duke University sells it now as the big novelty. I was compressing very, very rapidly and it always worked out.

SDM: How fast did you actually go down?

KELLER: I simulated one dive in a chamber in Toulon, where I

went from 300 feet to 1000 feet in two minutes. That was as fast as I could make it. I had tremors and so on, but nothing to worry about. I had dizziness, but that is no problem. For saturation diving one doesn't need my technology. I think our breakthrough was that we proved short, deep dives were possible and could be done.

SDM: Were you not the first to try alternating gases, breathing different gases at different depths?

KELLER: Yes. That made decompression very rapid and also allowed me to compress rapidly, but you can do it with other techniques.

SDM: Such as the tri-mix methods they are experimenting with at Duke University? Have you heard that they have made a simulated 1000 foot dive, with a tri-mix of helium, oxygen and nitrogen? They have found that in deep dives nitrogen negates the tremors and nausea of helium, and that increased pressure negates the narcotic effects of nitrogen.

KELLER: I, and I think also my colleagues, don't know much about what the nitrogen does in the body. I think the studies are very hypothetical.

SDM: Hannes, here's the point: they're still trying, right now, to get to 1000 feet quickly, and with fast decompression, which you proved could be done in 1962.

KELLER: It is very funny how research is duplicated, and how people don't ask questions. The scientists usually want to cook in their own kitchens and they're not interested in the menus of others. They don't even copy you.

SDM: You are probably very well aware of the fact that after your 1000 foot dive a lot of people were yelling, "Hannes Keller is against science, against progress," because you wouldn't say what your 'secret' formula was.

KELLER: In 1964, Buehlmann and I published our method in the *Journal for Applied Physiology*. The reason we didn't publish it somewhere everybody would have easy access to it was because we didn't want these decompression schedules, which were purely experimental, copied. It was too close to the border of potential accidents. For example, I have calculated my 1000 foot decompression for five minutes bottom time. Now, if you stay eight minutes instead of the five minutes, then you need a decompression that takes at least twice the decompression time I had. Actually, three or four



"It is very funny how research is duplicated, and how people don't ask questions. The scientists usually want to cook in their own kitchens and they're not interested in the menus of others . . ."



"I'm not a scientist. Maybe I'm a charlatan, a very good charlatan, and a good charlatan in many different fields."

times. And, if somebody now took my decompression tables from those experiments, the risk would be too much. Because of the accident we had to cut our bottom time by two minutes, from five minutes to three. We sent reports to five publications, to some doctors, the U.S. Navy, the Royal Navy, and other institutions. I'm sure Dr. MacInnis and other friends have it. To the scientists we always show what we have.

SDM: It seems significant that 12 years ago you accomplished this feat, and that today there is still not a working dive to that depth, which was actually 1020 feet according to the records.

KELLER: That is something I don't understand. If they would ask me, over the phone I would tell them how to do it. But nobody, over all these years, has ever asked me the questions, 'How did you do it?' 'Could we do it also?' If they would ask the question I would tell them immediately. I just don't run around to tell people, 'O.K., do it this way.' Before 1963 I was interested in having it myself because I was interested in financing my research, but the moment we had it financed by Shell Oil in 1963, there was no longer a necessity for secrets. Then it was published. Most people don't read scientific publications. There are few reading the *Journal of Applied Physiology*.

SDM: What do you think of the current state of commercial deep diving, in relation to what you did?

KELLER: The problem is naturally money and interest. Today, depth is no longer a problem. If COMEX decided to make a 2000 foot dive, a record dive in the ocean tomorrow, they could do it if they would be willing to pay the price for it. Depth, gas mixtures, and decompression are no longer a problem. Maybe such a dive would not be very efficient, but today you can do anything you want.

2000 feet would be a hell of a thing, but it's not only a question of money. Right now, there's no reason to do a 2000 foot dive because you cannot use it efficiently for practical work. In the past years we didn't have such a big offshore oil industry, so the oil companies were not terribly interested in depths. Now the situation has dramatically changed. There has been a tremendous boom, there's a lot of money going into offshore development, and deep diving will be developing very, very rapidly now. It's only a question of money; not a question of geniuses, pioneers.

SDM: At the time you were making your deep dives, or shortly after, you got very little support from the industry or from the U.S. Navy. Do you feel that what you have done has made the full circle?

KELLER: I think that I actually got a lot of support. Commandant Cousteau supported me in the very beginning. The Navy still thought it risky to support me. The industry was frightened to death to support me because they were wary of accidents. Cousteau did it I must say. He convinced the French Navy to have the chambers at my disposition and got some financial backing for the dives at Toulon.

For my deep dives, the U.S. Navy sponsored me and gave me the money I needed. My problem was not so much money, but developing the know-how. There were certainly conceptual errors in my 1000 foot dive. The biggest error was that I did not fill the chamber with helium. I had air in the chamber. Now, this was a question of money. I could have done it, I could have sold my car and put helium into the chamber, but my feeling was that I needed to demonstrate an economical way of doing a deep dive. If I had used helium the routine would have been expensive; people would have said, 'O.K., he can do it, but deep diving costs too much, it's not economical. It can't be used.' At the time I believed I needed to demonstrate an economical way of doing it. That was wrong. That was entirely wrong.

SDM: What are you doing now?

KELLER: Probably the rest of my life will always be the research and development of equipment for diving. There are a lot of things right now. After my deep diving, I received an R&D contract sponsored by Shell Oil in Europe, and I have

developed chamber technologies, a diving suit, etc. for them. After that contract was fulfilled I produced pressure chambers for hospitals, doctors and navies, and I have made the first portable two-man chamber which includes full climatizing.

It is a chamber with CO₂ filtering inside and without external ventilation. With a portable chamber you can't really ventilate because you'll run out of air. I installed a CO₂ filter inside which will function for several hours. But in a hot climate the humidity inside raises to 100 percent and the inside temperature with two guys in it raises something like 13 degrees F. above ambient. Now in hot climates, people would just die inside so I have made a portable cooling unit for that chamber.

This idea I sold about five years ago. I made a couple of chambers and delivered a deep diving system to various companies. Then I entered into a license agreement with Babcock, Germany, and they now produce chambers according to my ideas. Babcock is a very big company that makes atomic power stations, thermo power stations. They have 20,000 employees and now have an ocean technology department. In the heart of that department is the chamber program.

SDM: What else are you into?

KELLER: I have a consulting contract with Aqua Star for instruments, and I have just created a new decompression slide rule. It's a very little piece of plastic. It is meant to be used in addition to a normal decompression meter. I believe a sport diver needs a decompression meter before he buys an Aqua-Lung. It is a must. One should do some kind of decompression in every dive regardless of no decompression limits. But, decompression meters only tell you when you should start decompressing. So, for a preparation of a dive, you still need the tables. The tables are too difficult to handle, especially for repeated dives, and so the slide rule simplifies everything. It shows time, depths, five different types of decompression and surface times. It's very simple and safe and Aqua Star is putting them out.

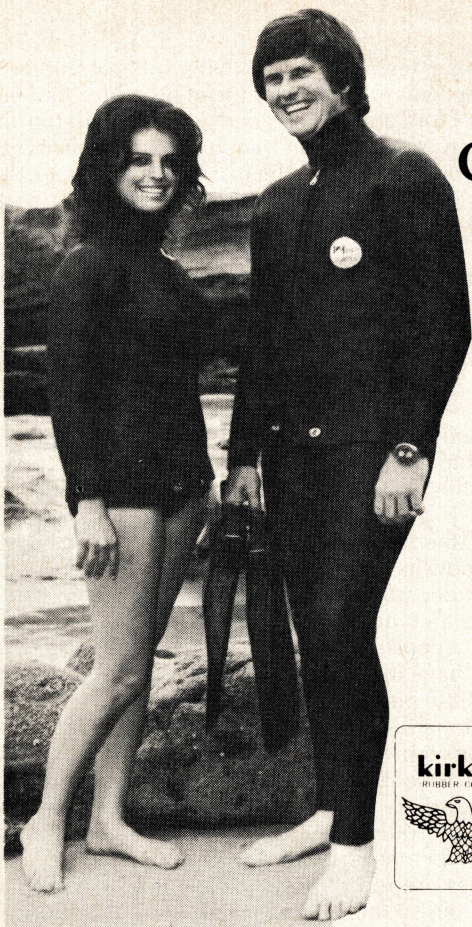
SDM: Are you doing any further work with gas mixtures?

KELLER: I am doing a new kind of analysis of decompression tables. I have found a new formula to calculate mixed gas decompression and I think I have found a very, very good solution for it. The idea is that with a little table computer you can calculate any kind of mixed gas decompression. You

(Continued on Page 24)



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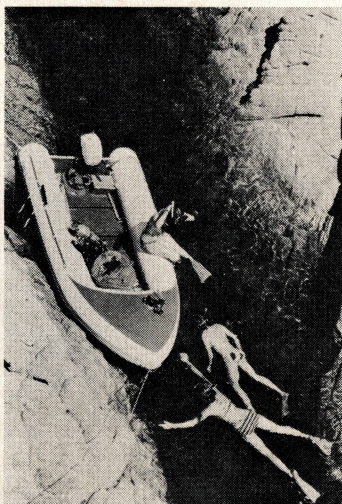
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HANNES KELLER
(Continued from Page 23)

don't need the big computers anymore. This concept now goes into my new big deep diving system. At the end of 1975 my system will operate in the North Sea. For a consortium I make a saturation complex based on a ship with a bell, with a depth capability of 1500 feet. The system has cryogenic helium purification and full computer control. For safety this system has two computers working parallel, to control both: decompression plus operational procedures. I believe that we are making the most advanced deep diving capability.

SDM: Do you think sport divers will ever get into any sort of sophisticated gas equipment?

KELLER: No, I don't think so. I think what we have today with the compressed air system is something so simple that you can't really beat it. It's like the bicycle. You can't really improve the bicycle; you can change it a little bit, but it's still something that remains basically perfect, like shoes.

SDM: In London you gave a talk on diving in the year 2001, in which you expressed some rather far-out ideas about the future. What were some of these thoughts?

KELLER: Mainly I think the big problem is the diving suit. Today's wet suit is overly priced, stupid, bad, lousey material, lousey cuts, and it's not safe. If you run into the slightest problem, you are in trouble. Insulation is bad, everything is bad. I don't want to blame any maker of suits, but everybody makes them as they have always been made.

SDM: Are you talking just of the material — neoprene?

KELLER: The conception — from the material to the making of the suit. I believe in a dry suit, with buoyancy control, made out of some material which is resistant on the outside but which still has the excellent flexibility of neoprene. Something resistant and protective, but comfortable. Something to keep you dry, and in case you lose consciousness you can continue to breathe as long as there is air. But instead of sinking to the bottom, you float to the surface where you recover. If you have an accident, running out of air you can't worry about decompression, you have to get to the surface to be picked up.

SDM: If a diver is at neutral buoyancy and suddenly passes out, how is the suit going to bring him up?

KELLER: Glad you mentioned it. I have solved the problem. I have a prototype, a suit that brings a diver to the surface in such a situation. But it's not for publication. I have to complete the development, even though I am far advanced with it.

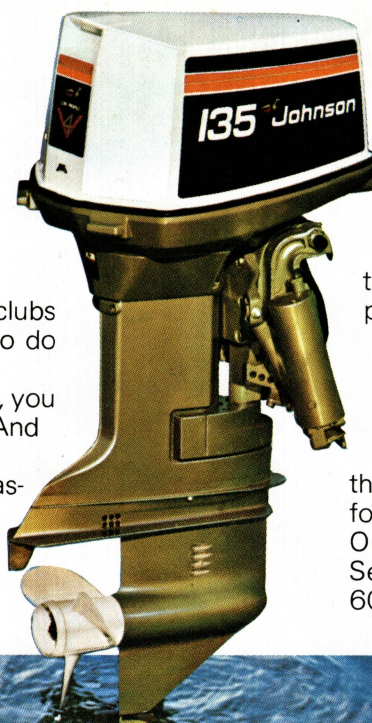
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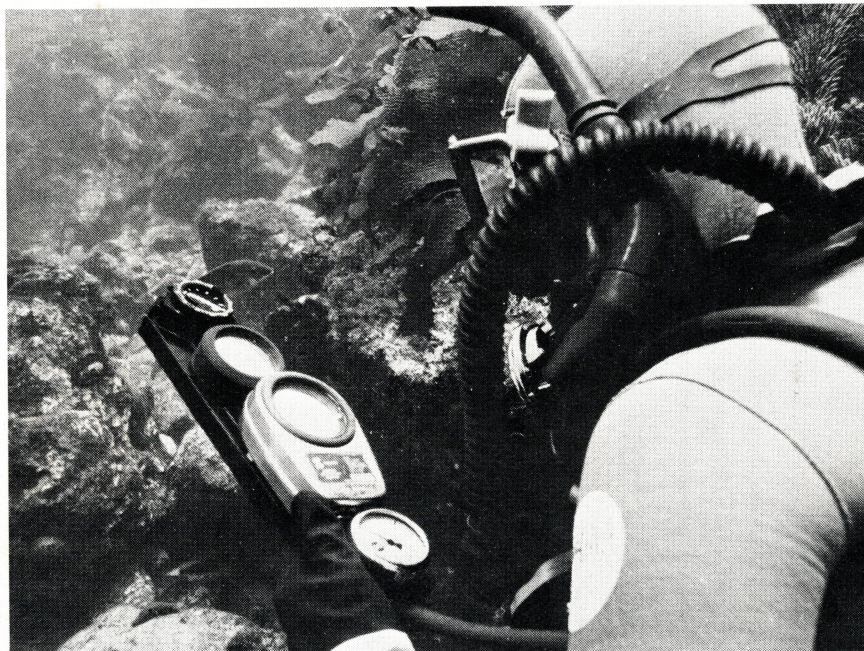


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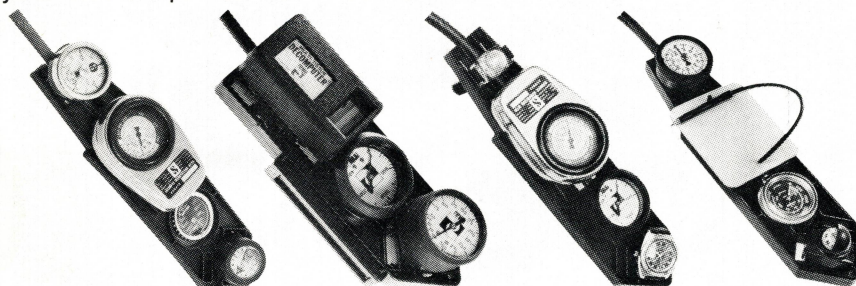
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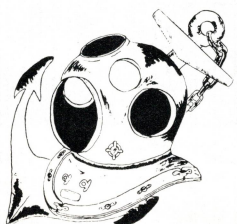
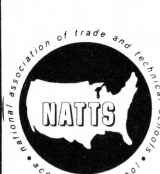
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HANNES KELLER

KELLER: Because it's a dry suit, I would use a foam material, an open-cell foam material, not a closed-cell. Then it would not squeeze a bit, and it can be equalized. The outer surface would be very resistant and on the inside we would have some sort of a plastic material which is very soapy. Very easy to get in and out. The inside material is the most expensive material in my suit, but it is very comfortable. The outer material is already developed, too. It's a very flexible material, resistant, and you can make it metalized so that it looks like gold, or silver, or copper. It's fantastic.

SDM: Gold? That is fantastic! Do you foresee any changes in basic gear like fins, or a mask?

KELLER: Propulsion can be improved, at least. The moment we have a breakthrough with batteries, with power, then we might see a very small propulsion unit, something a diver can stick in his belt or connect to his back pack — something lightweight. One horsepower would be very good. A one horsepower unit you could make with roughly three pounds of weight, very small. But it's a question of the battery. Today the battery does not exist for this.

SDM: Hannes, what do you think about the state of diving technology? Do you think reasonable progress is being made in the development of most equipment, given the techniques we now have?

KELLER: Most technologies for the development of diving equipment are very, very primitive. When you look at this you won't see much equipment that is very convincing. When you develop a functional thinking, then you see many things that are not functional. For example, most of the diving gear is not designed by divers; it is designed on the drawing board. You can use it, but it is not good. For example: most firms are producing tanks which you are supposed to carry with a bent elbow. Crazy. You have to put the handle on the side. Then it is easy to carry. Now, somebody who has carried a tank knows this. Somebody at the drawing board wouldn't.

Also, life support for most submarines is not sufficient. You need at least six full days and nights life support for everybody. To do with less is crazy because to organize a rescue operation may well take six days. But within six days you can do everything in the world. If you don't have that time you may be unreachable.

SDM: Hannes, you have contributed much to the development of diving, and in many different areas. How do you see yourself in the overall scheme?

KELLER: I'm not a scientist. Maybe I'm a big charlatan, a very good charlatan, and a good charlatan in many different fields. Naturally, when I do something I try to be good and do a professional job, and al-

ways remember that 50 percent of my business is fighting the inevitable risks. But I would have felt utterly ridiculous if I had tried to be the record-setting mad scientist for the rest of my life. No, I'm not a scientist, I'm not a technician, I'm not a businessman, I'm not even a diver. I'm nothing of that — but I know a bit of everything and I can combine the things.

SDM: Plus, it seems that you're willing to try everything.

KELLER: I'm many-sided. That's my strength, to be many-sided. This has advantages, and also disadvantages. Actually, I want to have an interesting life, that's what I want. Whatever it is. I would not be happy with just adventure, or just money-making, or just chasing girls, or just engineering things. I am the man looking for the right mix of all to get me into the depth of life. That's really my thoughts on life, so that at the end of it I can say it was worth it to have it. >>>

CAVE DIVING SEMINAR

The National Association of Cave Diving will hold its annual seminar June 14-15 in Jacksonville, Fla. The eighth in N.A.C.D.'s series of yearly seminars on diving science and technology is to be held at Jacksonville Beach, directly on the ocean. The faculty will be made up of experts from diving and cave diving.

This year's seminar will differ from past years in several respects. First the basis of the seminar has been broadened to include all diving related sciences and technology in addition to cave diving. Second, while formal presentations or faculty topics will still be a part of the activities, the majority of the time will be



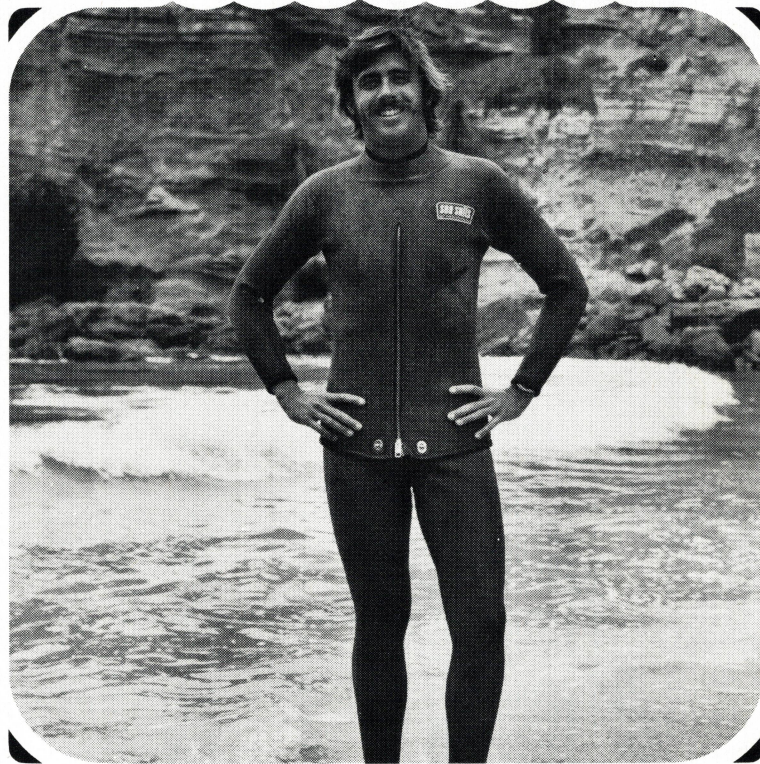
spent in discussion workshops where the seminar attendee can hold conversation directly with each speaker on his field of specialized knowledge.

Some of the subjects to be presented are cave diving techniques and equipment, hypothermia in diving, physiological profiles of the safe diver, decompression theory, speleogenesis and speleology, medical aspects of diving, diving legislation, statistics of diving fatalities, and emergency rescue procedures.

Expected speakers and workshop leaders include Tom Mount, Dave Desautels, Larry Murphy, Dr. Edward Vale, Dr. Bob Mallot, Dr. Bob Smith, David Fisk, and Captain Jack Wright.

For further information and seminar registration, contact the Seminar Committee, Bob Woolf, Director, 5018 Kerle St., Jacksonville, Fla. 32205. >>>

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OUR FUTURE IN DEPTH

The second annual Our Future In Depth program has been rescheduled for April 26, 1975. The planned daytime seminars and evening film festival will be held at Nottingham High School on Meadowbrook Drive in Syracuse under the sponsorship of several central New York diving organizations.

The daytime seminars will begin at 9 a.m. with outstanding speakers on such topics as Caribbean and South Pacific travel, underwater photography, equipment, instruction techniques and diving medicine. There will be items of interest to the general public as well as to divers. Of special interest to divers from the Northeast will be talks on diving in New York state, collecting historical artifacts and wreck diving.

In addition, a full day program on careers in the ocean sciences has been planned for high school and college students and educational guidance counselors. Some of the topics to be covered include oceanography and ecology, marine biology, retail diving sales, photojournalism underwater, conservation and police and rescue diving. Representatives from colleges and trade schools, manufacturers, police and conservation departments will present up-to-date information on the future of diving in their respective fields and how to prepare for that type of work. Speakers will remain through the day to talk with students and counselors individually.

Some 15 displays by diving manufacturers, schools and stores will be set up in the lobby featuring the latest in diving equipment. Local and state diving organizations will have displays on their activity programs. The booths will be open from 9 a.m. to 5 p.m. and again from 7-8 p.m.

The charge for the entire daytime seminar program is \$3 for adults and \$2 for students.

At 8 p.m., an underwater film festival will begin in the 1500 seat auditorium. Paul Tzimoulis, publisher of SKIN DIVER, will present a multi-media program on diving in Micronesia and Bonaire. Bob Hollis, of Andrea Doria fame, will show his film on the 1973 attempt to salvage the Doria, and *Windjammer*, a superb film on diving in the Netherlands Antilles.

Stan Waterman will be our guest again this year, presenting a totally new array of films on killer whales and octopii, the Bonaire Reef and an exciting treasure diving film he made with Teddy Tucker in Bermuda. Tickets for the evening film festival will be \$4.50.

A reception will follow the film festival where the audience will be able to meet and talk with speakers from both the daytime and evening programs.

The proceeds from Our Future In Depth will be used, in part, to establish a scholarship fund for deserving students entering the fields of marine science.

Tickets for the event are available from local diving clubs and stores, at the door, or by mail from: Our Future In Depth, 1425 Erie Blvd. East, Syracuse, N.Y. 13210, or by phone at (315) 479-5544.

SEA '75 — MAY 3 OAKLAND, CALIF.

Saturday, May 3rd, is the date for the Eleventh Annual International Film Festival and competition at the Oakland Civic Auditorium, Oakland, California. Produced by the Northern California Chapter of the Underwater Photographic Society, the program features films from such well-known photographers as John Clark, Jim Dutcher, Al Giddings, Bob Hollis, and SDM's Jack McKenney. Master of ceremonies for Sea 75 will be SKIN DIVER publisher Paul Tzimoulis.

The Underwater Photographic Society, a dedicated group of divers and photographers, encourages the amateur and professional to compete in the annual competition, and this year has added a novice division for beginners. The awards include special cast aluminum emblems of the society set on a hardwood plaque for first, second, and third place winners along with the coveted "Best of Show" award. Categories for the competition are: color prints, black and white prints, 35mm or 120mm transparencies, and motion pictures.

April 16th is the deadline for entries. For further information and entry forms write: the Underwater Photographic Society, % Richard Lang, 637 Ohio Ave., Richmond, California 94804. The film festival begins at 8:00 p.m. and tickets are available for \$4 each.

SEAMARK '75

Divers in the New England area are putting together a benefit program called Seamark '75. The New England Aquarium has made available all of its facilities on Saturday, October 11, 1975 for this first annual event. There will be capacity for more than 1000 people.

Masters of ceremonies for the evening are Frank Scalli, National Sales Manager for U.S. Divers, and Jim Cahill, president of New England Divers. Featured guests will include other prominent political and diving personalities.

Seamark '75 is a charitable event with all proceeds going toward building a Vision Clinic for the Cotting School for the Handicapped located in Boston: the fund goal is \$10,000. Coincidentally, it is hoped that the event will, in some small measure, help to improve public confidence in the scuba community.

This program wants and needs help from all members of the diving community regardless of affiliation. If you'd like to contribute your time and energy in a worthy effort or are interested in attending, please contact: Phil Holt, Coordinating Chairman, Seamark '75, P.O. Box 216, Gloucester, Mass. 01930.

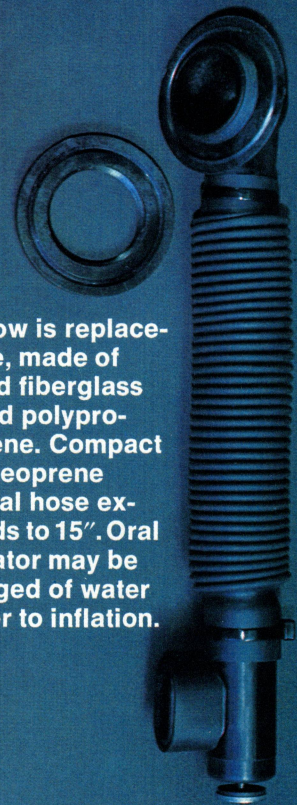
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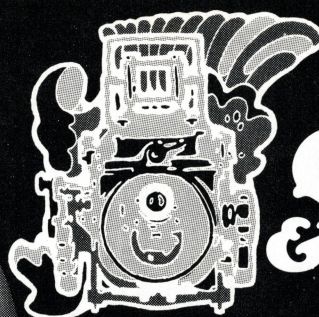


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PART LI

FEATURES FOR EVALUATING STROBE UNDERWATER PHOTOGRAPHY

By Jim and Cathy Church

The purpose of this article is to point out some of the features which should be considered when evaluating a strobe (electronic flash unit) for U/W photography. It is the first of a two-part discussion which will conclude in the next issue with practical advice about using strobes underwater.

Basic components — A strobe has three basic components: a power source, capacitor and flashtube. Electrical energy from the power source flows to the capacitor where it accumulates. When the strobe is triggered, the energy stored in the capacitor passes to the flashtube where it causes a brief flash of light — usually 1/500 to 1/2000th of a second. Because the flashtube gas is not consumed by the flash, the flashtube is capable of providing thousands of flashes.

Submersible strobes — For U/W photography, strobes can be classified as being either submersible or housed. Submersible strobes, such as those manufactured by Subsea Products (Box 9532, San Diego, CA 92109), are similar to the Nikonos camera in that they require no special housing. Their body shells, as well as openings for controls, are O ring sealed. Some submersible strobes, such as the Subsea Mark 50, 100, 150 and 225 offer adjustable power settings, and all submersible strobes can be used at depths of several hundred feet. A wide variety of arms, brackets and mounts are available for attaching these strobes to a Nikonos or housed camera.

Housed strobes — Housing a conventional strobe may be the best decision for the U/W photographer who already

owns a suitable strobe and wishes to use it above water as well as below. Several excellent housings are available from Ikelite (3303 North Illinois Street, Indianapolis, IN 46208, send \$1.00 for catalog), and Oceanic Products (814 Castro Street, San Leandro, CA 94577). Both companies also have arms, mounting bars, brackets and electrical cords and connectors for attaching the housed strobe to the camera system. When considering a housed strobe for U/W photography, remember that the quality of the housing and related equipment is just as important as the quality of the strobe.

Power sources — The three common power sources for submersible or housed strobes are: disposable, 1.5-volt flashlight batteries; rechargeable ni-cad (nickel-cadmium) batteries; and disposable, high-voltage batteries. Each has its advantages and disadvantages for the U/W photographer.

Disposable, 1.5-volt flashlight batteries can be purchased almost anywhere and offer compactness and low cost. Their small size results in miniature strobes weighing but a fraction of a pound. They often give up to several hundred flashes from a set of two or four alkaline cells at a cost of less than a penny per flash. However, these batteries require periodic replacement and will deteriorate with age.

Rechargeable ni-cad batteries may be built into the strobe, or into an interchangeable battery pack. Strobes with ni-cads are usually more expensive to purchase than strobes powered with disposable flashlight batteries, but are usu-

ally less expensive to operate in the long run because the ni-cads can be recharged hundreds of times. However, they often give fewer than one hundred flashes between battery charges. This can be bothersome to the U/W photographer who wishes to expose several rolls of film during the day. When reading the specifications for rechargeable battery systems, check the recharging time — it can vary from one to twenty or more hours, depending on the make and model of the strobe.

Disposable, high-voltage batteries, such as the 300-volt Photographic Flash Battery for the Subsea Mark 50 and 100, or the 510-volt battery for the Mark 150, offer up to 1,000 or more flashes before replacement is necessary. This is advantageous for extended diving trips when replacement batteries or electrical outlets are not available. However, there are disadvantages: The initial purchase price is significantly higher than for flashlight batteries, and fewer retail outlets stock these specialized batteries. They are bulky, heavy and deteriorate with age. In addition, the power output of the strobe will gradually decline, and the recycle time becomes longer, as the battery weakens and loses voltage.

Subsea Products has a rechargeable, ni-cad battery pack — the 510 Power Pack — which can replace the 510-volt, disposable battery. It gives about 100 flashes at the 150 watt-second power setting. Besides being rechargeable, the 510 Power Pack maintains constant voltage up to the point that the battery requires charging. Therefore, the light out-

put does not decline as the battery weakens. The built-in, ni-cad batteries of the Subsea AE 100 and Mark 225 strobes also offer the advantages of rechargeability and constant light output.

Recycle time – The time required for the capacitor to accumulate enough electrical energy from the batteries to power a flash is called the recycle time. Strobes usually have a built-in neon light (called the ready light) which turns on when the strobe has recycled. Depending on the model of strobe, power setting and battery condition, this time will vary. In our opinion, the average recycle time should not exceed about twelve seconds. Longer recycle times hamper your ability to shoot fast when you have a shy subject. Because the recycle time often increases as the battery becomes weaker, the advertised recycle times may be overly optimistic because they assume that the batteries are in peak condition.

Light output – The light output of submersible strobes is usually expressed in watt-seconds. While watt-seconds are an indication of the power available for the flash, the intensity of light falling on any part of the subject is also affected by the beam angle. The wider the beam angle, the more the light is spread, and the less the intensity on any given part of the subject. When comparing light output of submersible strobes, consult tables of suggested f-stops at various U/W distances supplied by manufacturer.

The light output of conventional strobes is usually expressed as a guide number for ASA 25. This guide number is divided by the strobe-to-subject distance to estimate the above water f-stop. For example, with a guide number of 80, and a distance of 10 feet, the f-stop would be

f8 ($80/10 = 8$). With higher-speed films, the guide number would naturally be greater. For U/W photography, these guide numbers must be adjusted for the absorption and scattering of light as it passes through water. Techniques of using above water guide numbers underwater will be discussed next issue.

Beam angle – The U/W beam angle of the strobe must be wide enough to cover the U/W picture angle of the camera lens. Keep in mind that whenever the strobe (or camera lens) is housed behind a flat port, the beam angle (or picture angle) will refract (be reduced) to three-fourths of the angle in air. Submersible strobes utilize dome ports to maintain the same wide-angle beam underwater as above. With conventional strobes housed behind flat ports, optical wideeners can sometimes be placed over the strobe lens to widen the beam. Honeywell, Vivitar and probably other strobe manufacturers supply plastic, wide-angle attachments for some of their strobe models. Oceanic Products uses a special optical port on their Hydro Strobe III housing to widen the beam. Additional wide-angle adaptors can be placed behind this port inside housing.

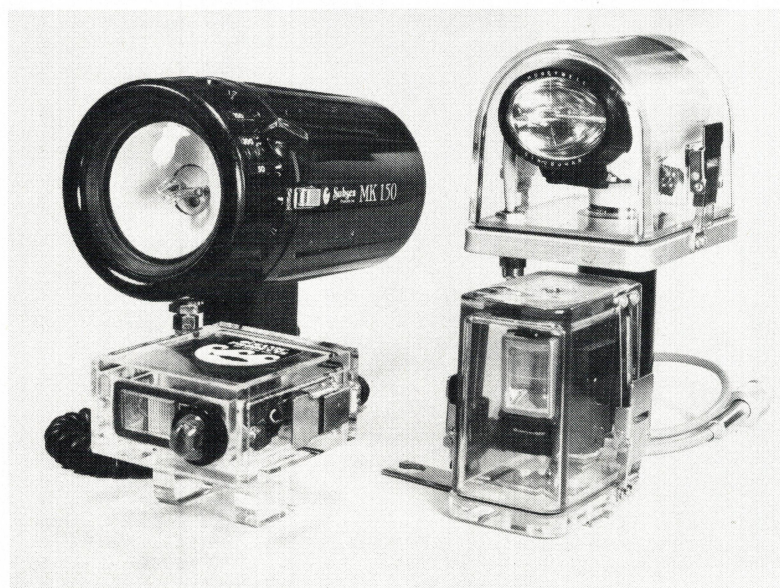
Automatic exposure control – Sensors mounted on strobes are usually of limited value for U/W photography. Light reflecting back from suspended particles in the water immediately in front of the strobe might upset accuracy. And because of the 45 degree side lighting commonly used for U/W photography, the light reflecting back to the sensor may not have the same intensity as that reflecting back to the camera lens. For close-ups, the automatic exposure control may require preset f-stops wider than

desired for acceptable depths of field. At longer distances, when the strobe provides fill light only, the automatic control provides no major benefit. For best results, a remote sensor (such as the Honeywell Strobo-Eye®) should be mounted near the camera. It can be placed inside the camera housing, or in a miniature housing of its own when used with a Nikonos camera. When used with one of the larger Honeywell Strobonars (with an ASA 25 guide number of 80 or more) the Strobo-Eye can be used effectively.

Slave sensors – A slave sensor triggers a strobe when the sensor detects the flash of light from another strobe. This allows multiple strobe lighting, such as photographs showing another U/W photographer's strobe flashing. Some strobes, such as the Subsea Mark 150, have built-in sensors. Others, like the Honeywell Strobonar 109, have "press-fit" sensors which attach to the strobe body. Other housed, conventional strobes can be used as slave strobes by attaching a Wein Micro Slave with a household-to-PC adaptor (or other adaptor, depending on strobe connections).

Synchronization – The strobe and shutter are synchronized when the shutter mechanism has completely opened (or uncovered the film for the exposure) when the strobe flashes. For mechanical reasons, most cameras with focal plane shutters will not synchronize with strobes at speeds greater than 1/60 of a second. However, cameras with between-the-lens (iris) shutters will synchronize with strobes at all speeds.

Conclusion – In the next issue we will move on to estimating U/W exposure guides, techniques of using strobes U/W and methods of prolonging battery life. 25

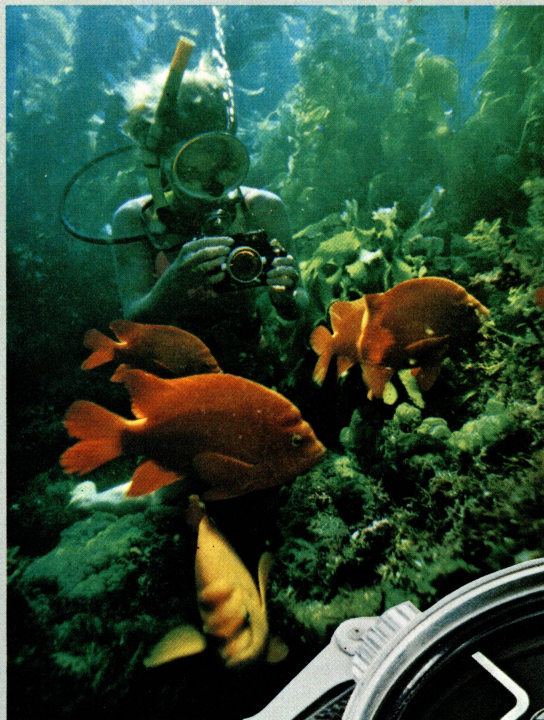


photography by Authors



Typical strobes for U/W photography include: (front) Vivitar 102 in Oceanic Products housing; Honeywell Strobonar 109 in Ikelite housing; (back) Subsea Products Mark 150 Submersible; Honeywell 710 in Ikelite housing. Above are power sources for strobes.

NIKONOS II IN ITS ELEMENT



It was born to the sea. Built by Nikon to capture your underwater adventures with the sharpness of a Nikkor lens, the speed of a fine 35mm action camera, and the quality that is Nikon.

Because the Nikonos II is a true amphibian, you can take it down 160 feet without a bulky housing to encumber your movements and spoil your "feel" of the camera. And, because the picture possibilities are so magnificently varied, Nikonos offers you a whole system for underwater photography: Four interchangeable Nikkor lenses, a precision closeup outfit, underwater flash, exposure meter, filters, and more.

Whether you dive for pleasure or treasure, take along the camera that's at home in the deep—and above the water, too—the compact, capable Nikonos II. At Nikon photo dealers and selected diving equipment suppliers. Or write for details. Nikon Inc., Dept. SD, Garden City, N.Y. 11530. Subsidiary of Ehrenreich Photo-Optical Industries, Inc. (In Canada: Anglophoto Ltd., P.Q.) 

NIKONOS II THE AMPHIBIOUS 35



OUR WORLD UNDERWATER

By Joyce Markstahler

MAY 2-4 CHICAGO

Beneath the glittering surface of the world's waters lie beauties and mysteries unseen by the majority of mankind — from the subtle grace of delicate plant life to the strange huge mammals. Those who have enjoyed these wonders have learned that to enjoy and participate implies also the responsibility to conserve, protect and preserve them for those who come after. This is the theme of Our World — Underwater V, to be held in Chicago on May 2, 3, and 4 at the Sheraton-Chicago Hotel and Medinah Temple: "Our World — Underwater: Ours to Enjoy, to Conserve, to Protect and to Preserve."

Among the famous divers joining the divers of the middle coast for this fifth meeting which includes seminars, workshops, cocktail and splash parties, a film festival and exhibits, will be: Jack McKenney, Editor of SKIN DIVER Magazine, Dr. Joseph MacInnis, Dr. Glen Egstrom, Al Giddings, Ernie Brooks II, John Steele, Dr. Ted Bank II, Tom Mount, Rick Frehsee, Bob Smith, Dr. Art Bachrach, Larry Cushman, Jim Joiner and divers from all over the United States and the world.

Dr. Glen Egstrom, the recipient of the 1974 Our World — Underwater award, will be on hand to present it to this year's winner, Jack McKenney. The award, presented annually, is given to a person who has contributed outstanding leadership to the sport of diving and to the preservation of its element. Previous recipients are the Cousteaus, 1971; Dr. Joseph MacInnis, 1972; Al Giddings, 1973; Dr. Glen Egstrom, 1974.

The second \$5000 scholarship will again be awarded to an outstanding student. Last year's winner, Mark V. Benson, will be present at the evening film festival to show a slide presentation of the *Scholarship Adventure*, which took him from the Arctic Circle to the Caribbean, from the east coast to the west. In addition to the awarding of the primary \$5000 scholarship a secondary smaller scholarship may be awarded.

The festivities begin with the pre-program reception and cocktail party on Friday night, May 2, at 7:30 p.m. in the exhibit area in the Sheraton-Chicago Hotel. All the honored guests, speakers and divers are invited to this informal get-together to mingle with each other and find out what's new.

Saturday morning at 9 a.m. the Your-Thing-Seminars begin in four concurrent rooms running from 9 a.m. to noon — investigating wreck diving, photography, travel and instruction, equipment and the diver. After lunch from 1 p.m. to 4 p.m. there are four more Your-Thing-Seminars — the wreck diving morning program will be repeated as will the photography program, there will be a room on sea life and mammals and the second half of instruction, equipment and the diver.

The scholarship banquet, honoring the recipients of this year's scholarships takes place from 5:30 to 7:30 p.m. in the hotel's King Arthur Room. This year's winners will be formally presented at this time to the speakers and guests attending.

The gala formal evening film festival follows the scholarship banquet at 8 p.m. at the Medinah Temple. This year it is a fast moving two and a half hours of action and adventure. Dr. Joseph MacInnis will be the emcee and show two of his newest spectacular films *The Bowhead Whale* and *Diving At The North Pole*. Al Giddings will present *The Sea of Eden*, Jack

McKenney will show his newest film *Fish Antics*, and Ernie Brooks II, President of Brooks Institute of Photography will present his spectacular multi-projector show. Topping it all off, Mark Benson will show slides of his *Scholarship Adventure* and be on hand as his successor receives the Our World — Underwater V scholarship grant.

And to top off the day, The Second Decompression Stop splash party takes place at the Sheraton-Chicago's 16th floor pool beginning at 11 p.m. after the film festival. Sunday morning and more activities: The careers in marine sciences program held in the hotel's grand ballroom begins at 9 a.m. with many of our guest speakers presenting the opportunities, pros and cons, pay scales and requirements for a career in underwater work. Simultaneously there will be workshops (mini-how-to courses) on ice diving, collecting artifacts, collecting marine life, spearfishing — freshwater, spearfishing — salt water. A room sponsored by the YMCA will present new adventures in diving — covering geographical, physiological, and psychological aspects of underwater diving. NAUI will also sponsor a room which will deal with aid to the distressed diver, diving accidents, diving emergencies, emergency ascents, and problems of deep and decompression diving.

Finally, an in-pool equipment demonstration from 2 p.m. to 4 p.m. will close this year's fifth annual conference.

It's going to be a weekend crammed full of adventure, education, parties, camaraderie, and sea stories. Plan to be there! Not only will you have a good time but you'll be contributing to the scholarship fund.

And as added enticements the national YMCA scuba convention will be held at the Sheraton-Chicago on May 1 and 2 in conjunction with Our World — Underwater. This convention is for YMCA scuba instructors and divers and will begin with a general meeting and then break into smaller work groups for program development. The work group sessions will include many topics: testing, standards, scuba club organization, mechanics of club organization, etc. The fee for the convention is \$15. For information write: National YMCA Scuba Headquarters, 1611 Candler Building, Atlanta, Ga. 30303.

Room reservations should be made directly with the Sheraton-Chicago Hotel, 505 N. Michigan, Chicago, Ill. 60611. Special Our World — Underwater rates are: single \$15.00, double \$22.00, triple \$27.00 and \$32.00 for a quad. Tickets may be purchased from Our World — Underwater, P.O. Box 643, Wheaton, Ill. 60187. Individual ticket prices prior to May 1 are: \$5.00 each for the Friday pre-program reception and cocktail party and for the Saturday Your-Thing-Seminars; \$4.50 for the evening film festival and \$3.00 for the Sunday workshops and seminars. After May 1 prices will be \$6.00 each for the cocktail party and the Saturday seminars, \$5.00 for the Saturday evening film festival and \$3.50 for the Sunday workshops and seminars. Tickets can be ordered as a package for \$15.50 (a savings of \$2.00) prior to May 1, and for \$18.50 after May 1.

For information write to Our World — Underwater, P.O. Box 643, Wheaton, Ill. 60187 or call (312) 286-8142.

photograph by Jack McKenney

OCEAN DUMPING EXPOSE'

Flower Gardens Among Gulf Areas Threatened

By Bill Barada

In June of 1974 the State of Florida challenged the federal Environmental Protection Agency (EPA) in court over an ocean dumping permit issued to a major chemical company. The result was an injunction against the dumping authorized by the permit and a court-ordered public hearing which exposed the EPA's ocean dumping policy as a sordid bucket of worms.

The evidence at the hearing disclosed that the volume of poisons being dumped under permit from the federal agency threatens to annihilate the commercial fisheries in the Gulf of Mexico. These are the most productive waters of the United States from which 25% of the nation's seafood is derived.

The problem is so serious that Florida has announced it is preparing a law suit against the EPA to stop all dumping in the Gulf. Other Gulf states, such as Alabama, Texas, Mississippi and Louisiana, are expected to join Florida in this suit, along with numerous conservation organizations and perhaps even other federal agencies.

It is ironic that a state had to go to court to protect its marine fisheries from actions by the federal agency charged with the responsibility of preserving these resources. The events and political maneuvering leading up to this expose sound like an environmental Watergate. And their disclosure should tell us something about the politics influencing bureaucratic manipulation of environmental protection laws in order to give preferential treatment to favored economic interests.

The laws governing ocean dumping are very clear. The EPA's authority to regulate this activity is contained in *The Marine Protection Research and Sanctuaries Act of 1972*, (P.L. 92-532) and in *The Water Pollution Control Act Amendments of 1972*, (P.L. 92-500). Both of these laws require that "applications for permits for dumping or other discharge of any materials into the marine environment be evaluated on the basis of the impact of materials on the marine environment and on marine ecosystems, on the present and potential uses of the ocean, and on economic and social factors involved."

The published policy of the EPA under the law is "to prevent or strictly regulate the dumping of any material in the ocean which would adversely affect human health, welfare, or

amenities, or the marine environment, ecological systems or economic potentialities, or plankton, fish, shellfish, wildlife, shorelines or beaches."

An EPA publication on ocean dumping, circulated for general public consumption, states, "The ocean's only defense had been its size. Now that man can defeat this size, it remains to him to protect the ocean."

Unfortunately, flowery words and impressive phrases do not protect marine life from the effects of poisons — and strong, clear laws passed by the legislature are meaningless unless implemented and enforced by federal bureaucrats.

Would you believe that the EPA approved the Flower Gardens coral reefs as an ocean dumping site for industrial chemicals and wastes? It's true. The Flower Gardens, located about 100 miles off the Texas-Louisiana coast in the Gulf of Mexico, contain the only living coral reefs on the North American continent other than Florida. Yet, this uniquely beautiful and productive area has been the dumping ground for chemical and industrial wastes for more than ten years, and most of it has been done with the blessing of federal agencies.

Protests by outraged citizens and local governments were virtually ignored. SKIN DIVER became involved in 1973 when a letter and news clipping from Royal Jenkins, a Texas diver, stated that the EPA had granted permits to dump hundreds of thousands of tons of highly toxic chemical wastes near the Flower Gardens. We initiated a research project in cooperation with the Southwest Council of Skin Diving Clubs and the Florida Skin Diver's Association, but all of our efforts came to a dead end. Letters to the EPA were answered with bureaucratic gobbledegook about dilution and dispersal methods — but gave us no details as to the kind of materials or the amounts being permitted. Also, all requests for information about environmental studies regarding the impact of these wastes on Flower Garden reefs were ignored. Hank Silver, president of the Southwest Council, told me that information regarding the companies receiving the permits and the chemicals involved were apparently as closely guarded as the Watergate tapes.

P.L. 92-500 requires "full public disclosure" of all proceed-

ings and "public participation in all decision-making processes" in any pollution abatement actions taken by local, state or federal agencies. Yet, nobody seemed to be able to get a complete and comprehensive picture of the EPA policy on ocean dumping, or what was actually being permitted in various sections of the country. Even the state of Florida ran into similar problems — until it took the EPA into federal court.



Photograph by Bruce Monier

Will continued dumping at the Flower Gardens produce cancerous sores on fish like these that were caught off the Southern California coastline near sewer outfalls?

Florida had no knowledge of potential trouble until Harmon Shields, director of the Department of Natural Resources, received a phone call from a Louisiana official warning him that the EPA had suddenly shifted the approved ocean dumping site to an area off the coast of Florida.

Florida had received no notice from EPA. No public hearing was held. The state had no knowledge of the amount or kind of wastes involved, or what evidence the federal government had to justify the permit. And the actual dumping was scheduled to start within a few days.

The National Environmental Policy Act, (NEPA) requires all governmental and private agencies to prepare an environmental impact statement on any project or action which has a major impact on the environment.

The EPA contended it is exempt from this law because it is the enforcing agency. No environmental impact statement had been prepared on the Florida dumping site, which had never before been used for this purpose.

The law requires that baseline ecological studies be made of all proposed ocean dumping sites.

No such studies had been made, or requested, by the EPA for any Gulf dumping site, including the Flower Gardens.

The EPA contended that Florida was not notified because the dump site was about 200 miles offshore and beyond territorial limits, so Florida had nothing to say in the matter.

Harmon Shields alerted Florida's Governor and Cabinet, a crash program was initiated to uncover the facts, and Florida went to court in order to obtain a temporary delay of the dumping scheduled under the permit.

The court-ordered public hearing broke the dam of secrecy and evasion. A battery of scientists, and officials representing all of the Gulf states, many of the Gulf counties and cities, private universities, and conservation organizations, appeared to testify in opposition to the dumping permit.

This testimony, although limited to the specific material permitted under a single permit to dump off the Florida coast, revealed the magnitude of the environmental insult presented by EPA's ocean dumping policy. It also became obvious that the agency's uncritical acceptance of the polluting industries' research as justification for these permits is an insult to the intelligence of the American people.

Equally important, the law suit prompted the release of testimony and details of previous permits in other areas of the Gulf. My friends in the Southwest Council and local pollution enforcement agencies were able to send me evidence of bureaucratic bumbling that reflects the contempt some federal officials have for the wishes and welfare of the people.

In 1974 the Texas EPA office granted permits for six companies to dump a total of 922,000 tons of liquid poisons — plus 8,000 drums of solid poisons, within seven miles of the Flower Gardens. The wastes in these permits were a witch's brew of long-lasting chemical poisons such as: organohalogens, toxic metals, acids, caustics, herbicides, pesticides, similar crud, known to be disastrous to marine life.

R. Barry King, diver-biologist and special investigator for the Harris County Texas Pollution Control Department, reported that similar chemicals had been dumped in the Gulf since the early 1960's — and much of it near the Flower Gardens, or right on top of the reefs.

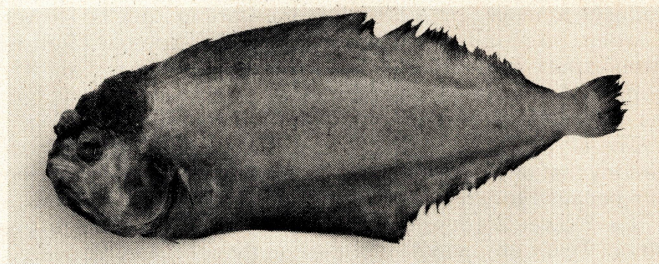
King wrote, "Back in 1973 . . . EPA officials told us they intended to renew these permits summarily and that no public hearings had been scheduled." King helped organize opposition and outraged citizens groups objected so strenuously that the EPA was forced to hold the public hearings.

A few highlights of testimony presented are revealing:

The Texas Parks and Wildlife Department stated, "It is our opinion that the dumping of any toxic, persistent chemical into the western Gulf of Mexico is indefensible from an environment viewpoint . . . We are particularly concerned with the possible biological magnification of toxic materials in the food chain and the effects it may have on the marine fisheries."

The National Marine Fisheries Service and the Bureau of Sport Fisheries and Wildlife of the National Oceanic and Atmospheric Administration, U.S. Department of Commerce stated, "We, therefore, recommend that no permit to dump in the ocean be issued for any parts of wastes that: 1. are toxic to marine life and are not rapidly rendered non-toxic and otherwise harmless by biological, chemical, or thermal processes in the area, or 2. will, if dumped, make edible marine organisms unpalatable or unsafe to consume, or 3. are insufficiently described to permit evaluation of their impact on marine ecosystems."

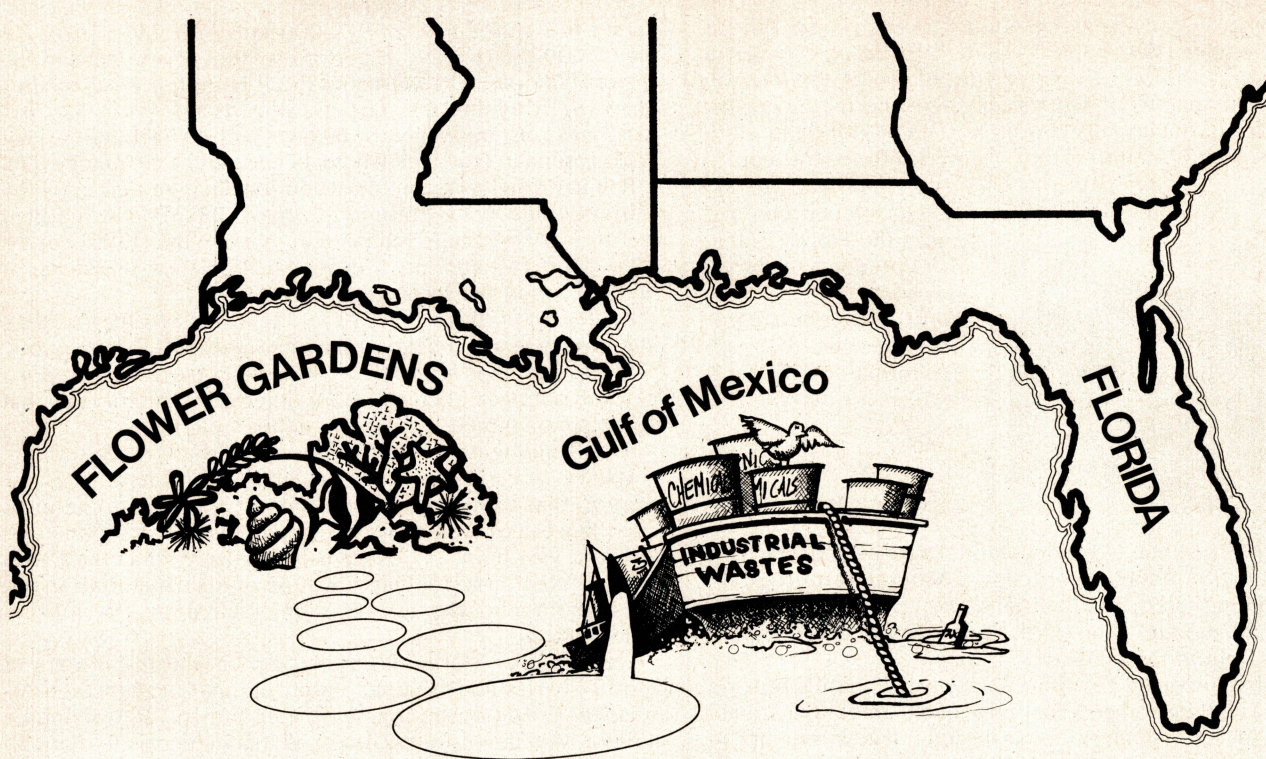
Similar objects, some of which presented scientific studies showing that irreversible damage to major fisheries would result from the dumping, were lodged by such organizations as: Gulf States Marine Fisheries Commission; Texas Shrimp Association; Texas Coastal and Marine Council; Sierra Club; and Audubon Society.



The wastes described in six dumping permits included acids, toxic metals, caustics, all disastrous to marine life.

Barry King testified that a workman was overcome by fumes from a leaking barge loaded with chemical wastes. The barge captain said he had often seen dead fish in the wake while dumping, and this was verified by one of the deck hands. Yet, at the hearing, the chemical company denied these reports. The barge captain changed his story, and the deck hand could not be located for comment.

Dr. Walter A. Quebedeaux, Harris County Pollution Control chief, testified that some of the chemical wastes, diluted to five percent, killed fish in five minutes. His report states, "The material in the waste appears to paralyze fish so they can't swim out of it."



Florida has discovered at least seven ocean dumping sites in the Gulf presently in active use and they suspect that many more exist. The Flower Gardens, the only living coral reef on the North American continent other than Florida, is one site.

In spite of this evidence the EPA issued the new ocean dumping permits. Their only concessions were: reduce the total tonnage (The figures cited earlier in this piece are the reduced tonnage.), move the dump site farther from the Flower Gardens (to 35 miles), and order companies to detour 15 miles around the Gardens on their way to dump. (The Coast Guard is supposed to police these operations, but to my knowledge, have yet to issue their first citation for a dumping violation.)

The EPA justified the permits on the basis of industry testimony that offshore dumping is relatively harmless to marine life because very little plankton blooms in deep water areas.

The Flower Gardens Ocean Research Center of the University of Texas dropped drift bottles on the reef, and recovered virtually all of them in shallow coastal waters, some were miles inland in bays and lagoons. The Research Center has also found abnormal concentrations of toxic metals in the flesh and tissues of marine life on the reef. Robert Alderdice, deputy director of the Research Center says that permitting ocean dumping in deep water on the basis of sparse phytoplankton blooms makes about as much sense as permitting radioactive wastes to be dumped over New York on the grounds that very little corn appears to grow in the area.

Similar "evidence" purported to show that chemical poisons are harmless to marine life when dumped in the open sea was presented by chemical company employees and their scientific hirelings at the court-ordered hearing in Florida.

The story that finally surfaced is that the chemical company was chased out of its inland dumping site in a local river, but obtained a permit to dump in the ocean off Louisiana from the inland EPA office. Louisiana protested. The dump site was

changed to Texas under permit from the Dallas regional office. Public outrage and protest caused Texas to rescind the permit. Then, wonder of wonders, the inland EPA office was permitted to override the Dallas office — and dump site was suddenly changed to Florida. A permit from the inland EPA office authorized the new dump site. The EPA region covering Florida was not even notified.

Florida agreed to present its case at the public hearing, but made it clear that it retained the right to continue the fight in court if necessary. Florida's attorney general has stated, your effectiveness in environmental protection is almost directly proportional to your opponent's conviction of your willingness to go to court. In this case, and others in which Florida has been involved, the federal government was the opponent.

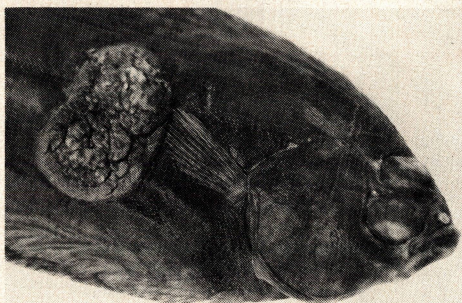
Once the public hearing was announced, virtually every person who had expressed an interest in the case or had contacted the EPA for information, was deluged with a flood of propaganda material from the chemical company, publicity releases, results of purported "scientific studies", and colorful articles were sent, all of which claimed that these poisons were "harmless to marine life in the Gulf."

It is a sad commentary on the status of our scientific community that "studies" and "reports" can be obtained to support virtually any preconceived position desired. An industry research scientist, when pressed at the hearing, admitted that his definition of "harmful to the marine environment" meant only if one could prove that these wastes had caused harm.

This policy has been described as simply an exercise in trying to figure out how much poison the ocean can absorb before it becomes a public nuisance. It has been demonstrated

over and over again that, once a conglomeration of chemicals and crud is mixed and dumped into a body of water to react with the chemical and biological actions of natural systems, nobody can legally trace lethal or adverse effects back to a constituent in a specific waste mixture. This was recognized by the Congress in the passage of P.L. 92-500 which requires the EPA to eliminate pollution at the source. Yet, the justification for ocean dumping permits is still based entirely on the discredited concept that dilution is the solution to pollution.

Since the EPA had made no studies or investigations of its own, the fight over the dumping permit was between industry representatives and scientists, versus state, local and independent scientists. Some highlights of the testimony are revealing.



One pollution expert found that some chemical wastes, diluted to 5%, killed fish in five minutes.

Industry publicity releases and official testimony claimed that the wastes in question were 75% water, with the balance harmless material that is non-persistent, non-accumulative and not subject to biomagnification by marine organisms.

Scientists testified that the volume of wastes to be dumped each month under the permit contained 30,000 pounds of antimony, four million pounds of ethylene glycol, and as much as 20 pounds of mercury and 30 pounds of cadmium.

Kenneth Kamlet, National Wildlife Federation attorney, testified that antimony is so toxic that doses as low as 97.2 milligrams have proved fatal to human adults, while 48.6 milligrams have caused the death of a child. Kamlet states, "A single month's supply of antimony from (this) waste product, properly applied, contains enough lethal doses to kill every man, woman and child in the United States." He stated that while a catastrophe of this magnitude is highly unlikely, with so many lethal doses floating around one cannot rule out the possibility of some lesser catastrophe.

Numerous other scientists introduced studies showing that antimony is not only lethal, it persists in the marine environment and is concentrated by marine organisms. The danger of human poisoning from eating antimony contaminated seafood is much like that of mercury, which has caused repeated epidemics of human poisoning in Japan (Minimata disease).

The National Academy of Sciences and the EPA have proposed 0.2 parts per million of antimony as constituting a "hazard level" in the marine environment. The waste which the EPA approved for ocean dumping off Florida could reach concentrations as much as 12,000 times this "hazard level".

Industry representatives and scientists stressed the discredited concept that poisons dumped in the ocean 200 miles offshore are so diluted and dispersed they present no hazard to productive estuaries, bays and shallow coastal waters.

Florida's Division of Marine Fisheries presented studies that show the dump area is circulated by the Gulf Loop Current, with a complex system of eddies, gyres and counter-currents. Drift bottles dropped near the dump-site were deposited along Florida's shoreline, not only in the Gulf, but throughout the Keys and along the Atlantic coast.

These currents tend to concentrate organic particles in surface slicks. Toxic compounds tend to adsorb and absorb to organic material and are picked up by plankton and marine

organisms. The operation of this concentrating mechanism is evidenced by large masses of stagnant water found in the Gulf. It is suspected of concentrating fish-killing red tide organisms. Thus the dumping of poisons offshore presents a very real hazard to inshore fisheries and to human health.

Florida has discovered at least seven ocean dumping sites in the Gulf presently in active use and they suspect that many more exist. Nobody really knows the total volume of poisons being dumped without a permit. And nobody seems to know the actual volume dumped under EPA permit. However, if only six permits reached a total of over one million tons per year, the total volume must be staggering and the danger of eventually contaminating all Gulf fisheries is obvious.

Mercury contaminated fish caused repeated epidemics of human poisoning in Japan that created a world-wide panic. As a result, a large percentage of Japanese citizens are afraid to eat any seafood for fear it may all be contaminated.

The same thing could very well happen in the Gulf of Mexico. Poisons other than mercury which can be accumulated by marine organisms and present a threat to humans are such heavy metals as cadmium, lead, zinc, arsenic, etc. — plus polychlorinated biphenols (PCB's) and a host of herbicides, pesticides and many organics.

It is estimated that 25% of the pollution generated by Mid-west states flows into the Gulf through the discharge of major rivers such as the Mississippi. As more and more industries are ordered to discontinue dumping their wastes into inland waters, the pressure on federal agencies to permit dumping this crud in the ocean will increase. There is little justification for a policy permitting dumping in the open ocean other than the fact that industry claims it is cheaper than other methods of pollution control. As the evidence developed at this hearing disclosed, dumping in deep water offshore simply spreads the poisons over a wider area, like spreading an infection. This has been documented in the New York Bight where a 25-mile area of the ocean has been so polluted by dumping that it is completely devoid of marine life.

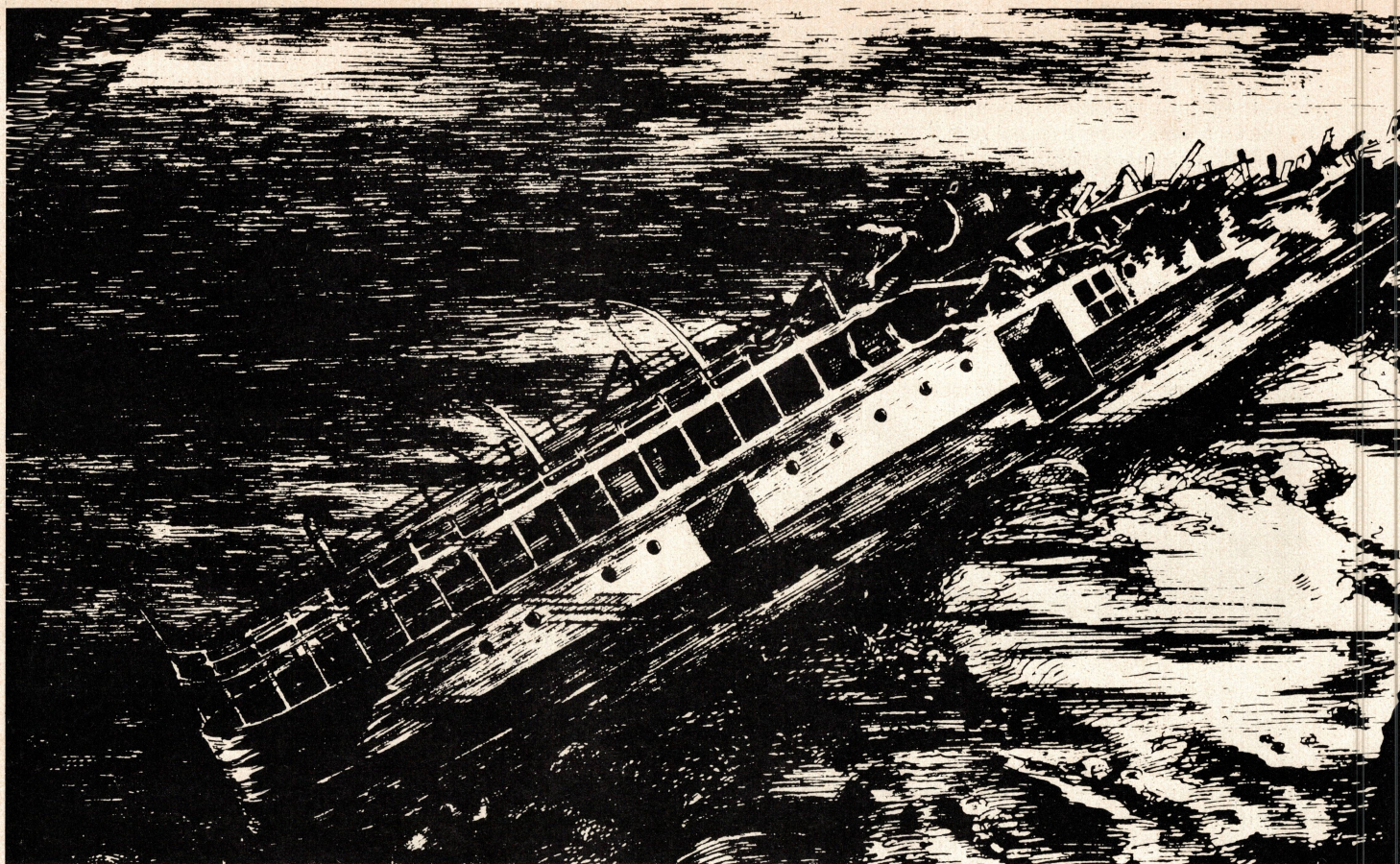
There are other methods of treating and recycling the majority of these wastes if they are separated and processed as an integral part of the plant's operation. The panic caused by a threat of mercury poisoning caused government to crack down hard to eliminate its discharge. In most cases, industry learned that reclaiming and recycling mercury inside the plant actually proved profitable.



Mysterious fish kills — are they due to dumped chemicals?

The world appears to be entering an era of shortages in basic resources and food production. Our survival as a nation may depend on finding methods of reusing our resources rather than dumping them in the ocean to contaminate seafood.

Florida won its case and the EPA rescinded this specific permit. However, it appears that the threat of court action weighed heavily in favor of the agency changing its mind. And the real battle over ocean dumping is only just beginning. If other states and organizations do not challenge EPA policy in the courts, the inadequate criteria used in the Gulf may persist, the environmental protection laws will be meaningless — and we may see an almost universal contamination of marine fisheries throughout the world ocean.



ISLE ROYALE - Lake Sup

A moment of falling, a splash and then a thousand piercing icicles attacked! For just an instant we were stunned, completely overwhelmed by the punishing cold. Although all four in our party had been diving in Lake Superior for years, the waters around Isle Royale National Park somehow felt especially numbing that day.

We were on this expedition as a result of a telephone call from Jim Perrin, a scuba instructor and friend from White Pine, Michigan. Jim had announced that he had converted his old bow picker fishing tug *W.R. Busch* into a dive boat and was running her over to wreck strewn Isle Royale for a week at the end of June. Would we like to join him?

With mounting interest we inquired, "What have you done to convert the *Busch*, Jim?" "Put a portable compressor aboard, of course," came the terse reply. He spoke with a directness we couldn't refuse, so when the time came, three of us, the two authors and George Tomasi, boarded the seaplane at Houghton, Michigan, for a 30 minute flight to Isle Royale, which lies 50 miles north into Lake Superior and is geographically closer to Canada than the United States.

Before the days of aids to navigation, Isle Royale was a most unwelcomed challenge to seagoing captains, and today's navigators traverse the 50 mile long island with a 10 mile 'beam' with the utmost of caution. Our interest was in the 20 some vessels which failed to meet the challenge, and all during our preparations we had swapped stories about the wrecks of the *Congdon*, *Emperor*, *Algoma*, *Monarch* and *America*.

Upon our arrival at Rock Harbor, at the northeast end of Isle Royale, we boarded the tub which was to be our home for the

next four days. Glancing about the interior of the completely enclosed fishing boat, we realized that Jim had not exaggerated the *Busch's* conversion, or lack of same, into a dive boat. Equipped with a Coleman stove, coffee pot, air mattresses and sleeping bags, we would spend four of the coldest, rainiest, foggiest, most wonderful days of diving on the most fascinating wrecks that the Great Lake, Superior, has to offer.

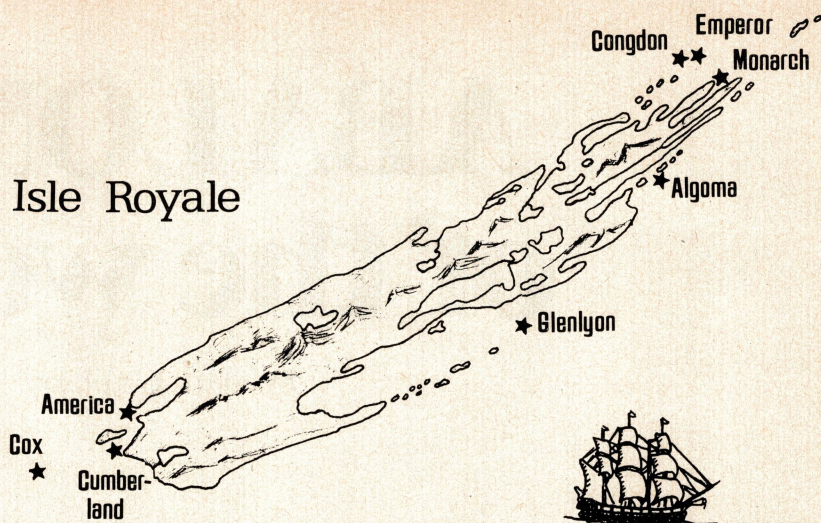
Without wasting a minute, Jim set up the portable compressor and began to fill our tanks. He had each tank ingeniously hung on a line from the hand rail as it was being filled so the cooling waters of Lake Superior could keep it from overheating. By the time we had met our two traveling companions — Kim McConnell, who was an extremely good diver, and Taryn Bigley, who was invaluable in the galley producing delicious meals from our somewhat sparse food supplies — we had already decided that there was still enough daylight to dive the *Algoma*.

The *Algoma*, a 279 foot passenger steamer, met her demise on November 7, 1885, off Mott Island. Trapped in one of Lake Superior's infamous fall storms, her captain decided to go out to open sea rather than attempt passage through rock, island and reef strewn Isle Royale. Unhappily for the distressed vessel, she struck hard upon an uncharted rock, and wave action sweeping over her decks soon destroyed all but one of her lifeboats. Early during the morning of the eighth, after what must have seemed a long, long night, she broke in two with the bow slipping into deep water carrying most of the 37 passengers, all of whom lost their lives. The bow, with its macabre cargo, has never been located.

The story of the *Algoma*, and other vessels which had met similar fates in the immediate vicinity, is the reason the area is



Isle Royale



photograph courtesy Mariners Museum, Newport News, Va.



Illustration by Gene Sniervo

The artist's rendition of the America looming ghostly in the half-light of Lake Superior's depths shows her scattered bow, the result of blasting as a hazard to navigation. The photograph of the Emperor shows her before her "death" on Isle Royale's razor sharp Canoe Rocks.

erior Wreck Dive

By Frederick Stonehouse and Betty Tomasi

called "hell's half acre." As we glanced at our wrist thermometers during that first dive, however, we couldn't help but think of the ineptness of the nomenclature — in terms of temperature, anyway. The mercury was registering a chilly 35 degrees, confirming what we already knew — it was cold! We scrounged in depths from 35 to 115 feet looking for goodies until we had exhausted our air supplies and ourselves, then we returned to the *W.R. Busch* where Taryn greeted us with a pot of hot coffee.

While Jim and George filled tanks, we tried to decide which of the many exciting wrecks we wanted to dive in the morning. Finally it was agreed unanimously that there could be no greater thrill than to dive on an intact ore carrier which was reported to be a cliff hanger — a wreck with its bow clinging tenaciously to a shoal in about 35 feet of water, and her stern extended precariously out in liquid space. Without further discussion we headed directly for Canoe Rocks where the *Emperor* had struck in 1947.

It was on June 4 of that year that the *Emperor*, a 4641 ton steel steamer of the Canada Steamship Line, rammed a rock near Canoe Rocks about three miles from Blake's Point Light. Although her boilers exploded, killing 12 of her crew, she is virtually intact. Now we were fully suited and eager to execute backward rolls which would once again plunge us into the frigid water. Perhaps because we were already semi-frozen from the cold rain and winds, the water didn't seem like such a jolt this time.

Heading down the anchor line, we followed Jim's advice and turned right to run a course down the slope of the underwater mountain. In less than three minutes we saw the gigantic ghostly hull of the bow looming about 20 feet in front of us. Swimming over to her, we became keenly aware of her enormity. Although

winter storms have crushed her superstructure, she is still an impressive sight.

We decided to descend her deck and examine the ore carrying holds which were exposed like mammoth gaping mouths. Down, down the starboard side of the deck — it was an easy swim since she slopes on a 45 degree angle down the side of the mount. When we had explored approximately one third of the vessel aft of the bow, we saw a large crack where at some point in history she ceased being a cliff hanger and, with what must have been a thunderous lament, broke to port and settled against the side of the mountain.

Because of her immense size, over 500 feet long, it took us a moment to determine exactly what had transpired. Once we had it figured out, we swam over to her broken section just fore of amidships and continued our eerie descent. At nearly 100 feet we were acutely aware that we would not reach the stern on this trip. Checking our pressure gauges, we were also cognizant that the remainder of our air supply was needed for the sharp upward climb back to the bow.

Safely back on the *Busch*, we eagerly made plans for descending to the stern, which is in about 150 feet of water. But bad weather came up and we never did get back to her on that trip. We did dive on the *Monarch* and *America*, but since nature's superiority over much more seaworthy craft than ours was the very reason we were diving these waters, we decided to be judicious and not add the *W.R. Busch* to the more than 500 wrecks in Lake Superior. Most of those wrecks have not been visited by scuba divers yet, and each holds its own story of charm, excitement, romance and ultimate death. >>>

ABALONES of the world

By Mark E. Gibson

Intriguing, grotesque, elusive, and so on. Everyone could have a different description and appreciation for the group of marine animals known as abalone. To the world's diving community abalone provide a unique hunt and beautiful shell in addition to a meal also relished by millions of non-divers. In the scientific world abalone provide endless opportunities for research and development leading, hopefully, to large scale culture. Known outside the United States by such names as Orielle de Mer and Si-ieu (France), Ormer and Venus Ear (England), Ohrsnacke and Merrohren (Germany), Mutton Fish (Australia), Bia Scatsjo (Malaya), and Awabi (Japan), abalone have been described, fished, hunted, traded, pictured, painted, and eaten since Aristotle first mentioned them in the fourth century B.C.

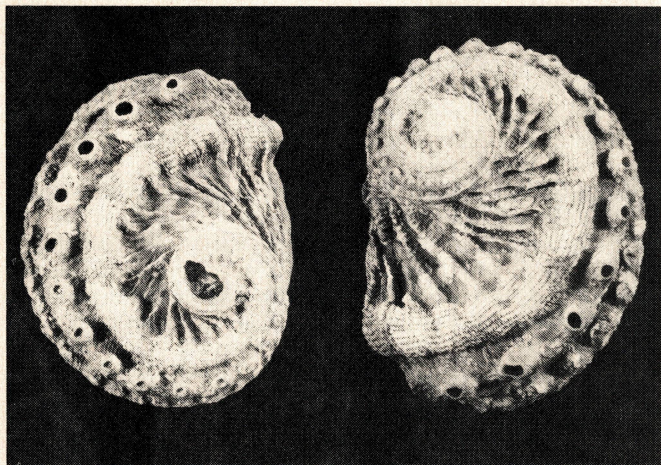
How does a strange beast like an abalone fit into nature? Because of the heavy shell abalone fit nicely into the animal phylum Mollusca, which is characterized by a hard, calcium carbonate shell. Other members of this phylum include snails, clams, oysters, limpets, chitons and not so obviously, octopus and squid. Abalone belong to the class Gastropoda, which is snails, and the order Archaeogastropoda. The prefix Archaeo- refers to the primitive evolutionary status of abalone. All abalone belong to the family *Haliotidae* and the genus *Haliotis*. Conchologists (those who study snails) currently believe there is at least 130 species and subspecies of abalone, a figure highly debated because abalone freely hybridize. That is, separate species cross fertilize to produce an individual with the characteristics of both the species. The shape, size, coloration, number of holes, and distinctive marks of the shell

are used to distinguish species. These important characteristics get mixed up in hybrids and, therefore, no one can say exactly how many species of abalone are known. In addition, shells of any one species can be moderately variable.

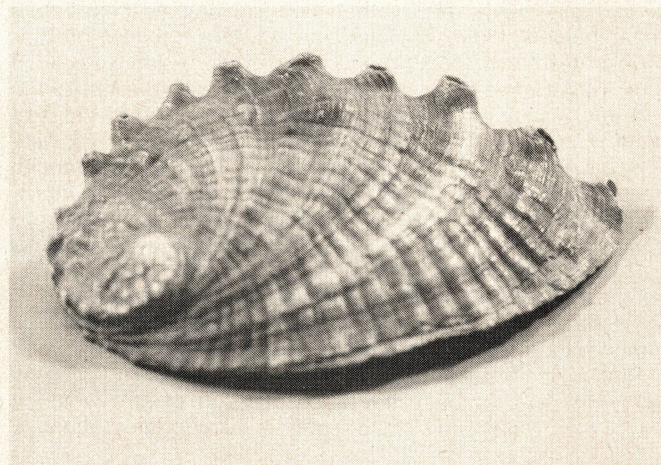
Although abs can be found in nearly all seas and to great depths, there are some major coasts that lack these incredible molluscs. South America has only one spot (Rio de Janeiro) where an abalone shell was found on a beach. Otherwise, the entire South American coast is bare of abalone. Strangely enough the Galapagos, just west of Ecuador, has several species. Other areas where ab irons aren't used for abalone is the Arctic, most of the Antarctic, both coasts of Mexico, and the eastern coast of North America. In all fairness I should point out that Florida does have one species of abalone, but it was dredged from very deep water and, as of 1960, it had only been recorded twice. The greatest numbers of species and individuals are to be found along the coasts of Japan, Australia, and western North America, where professional and amateur ab divers can be found by the thousands. The red abalone, *Haliotis rufescens*, is the world's largest abalone since there are records of shells over 11 inches! Those taken by divers average between seven to nine inches in diameter. California has seven other species of abs to dive for, although they average around six inches. Red ab is most common in northern California and is much less common in southern California.

Diving for abs in general is a kind of paradox. The prey sits still while the hunter darts about among the kelp. It is free diving only in northern California while scuba is used in the southern parts. For the non-ab diver this hunt may not sound

H. tricostalis/Australia



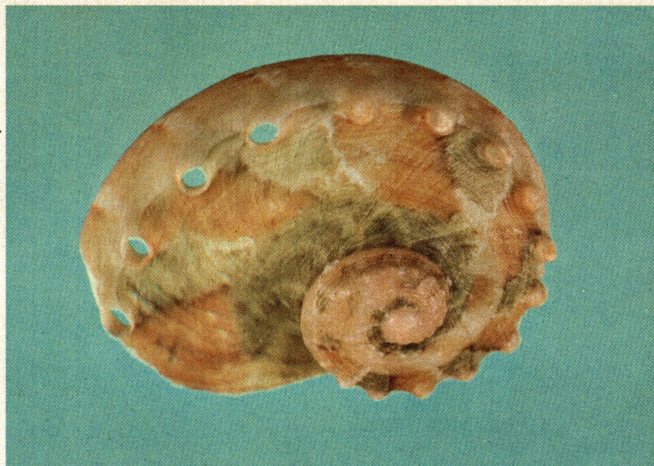
H. gigantea/Japan



H. assimilis/So. Calif., Baja



H. brazieri/Australia



H. fulgens/So. Calif., Baja



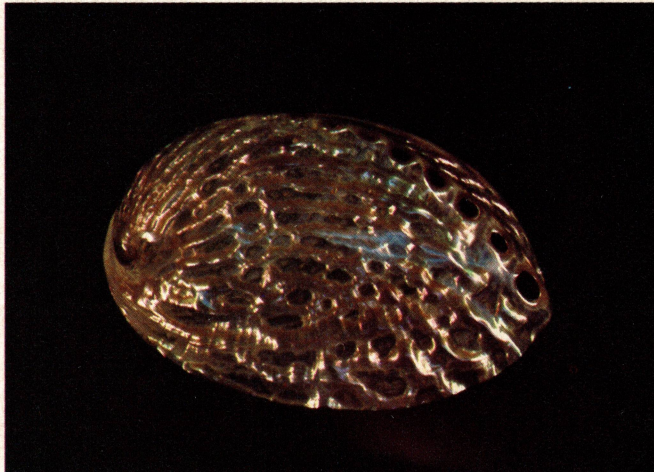
H. iris/New Zealand



H. midae/So. Africa



H. discus/Japan



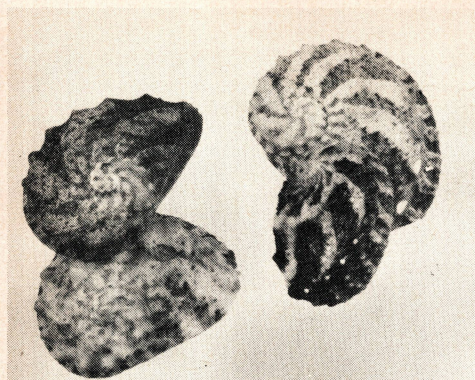
Photography by Author/Shells courtesy of California Academy of Sciences

like much. But the plot thickens when you are free diving to 25 feet or more and trying not to get tangled in the kelp while attempting to sneak up on something that looks like a rock and hides in cracks. It may not always be that bad, but often it is.

One scientist counted no less than 150 different organisms living on the back of one red ab shell! Perhaps this is nature's finest attempt at a garden living on the back of another organism, and a garden such as this has plenty of time to grow. A red ab takes about 13 years to reach the legal catch size of

seven inches. It is estimated that an 11 inch might require a mere 25 or more years. Coupled with this is the ab's slow movement, estimated at about four feet per year once it has settled in its home. One other peculiarity is that abalone are hemophiliacs. Once they are deeply cut they will bleed to death, so, careful with that ab iron.

The shell can vary from thin and light to thick and heavy. The interior pearl surface has a beautiful iridescence that has been incorporated into many millions of buttons and pieces of



H. ovina/N. Zealand, Fuji, Philippines



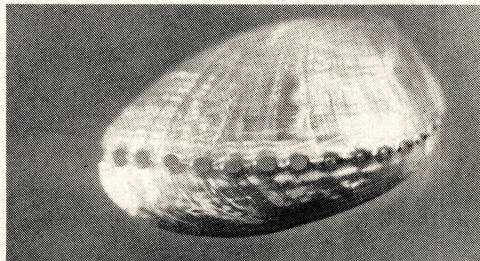
H. cracherodii/Oregon, Calif., Baja



H. asinina/Aust., Japan, N. Caledonia, Phil.



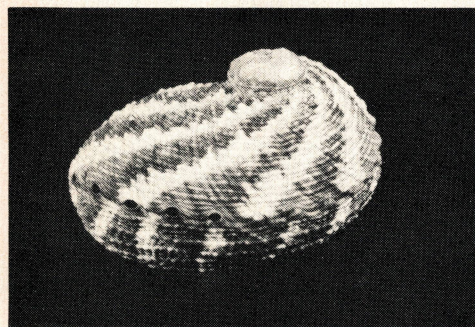
H. rufescens/Oregon, Calif.



H. laevigata/Australia

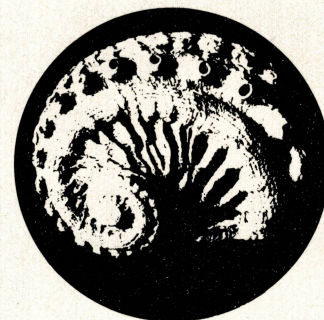


H. sanguinea/So. Africa



H. cyclobates/Australia

All abalone belong to the family Haliotidae and the genus Haliotis. Conchologists currently believe there is at least 130 species and subspecies of abalone. Shells normally taken by divers average between seven to nine inches in diameter though there are records of shells over eleven inches in length!



jewelry. The outer surface, when cleared of all foreign growths, can have many colors and patterns depending on the species. The pure white outer surfaces pictured here have been cleared of all foreign growths and the natural exterior shell surface. The polished shells are pure nacre, the pearly material of the interior. Nearly all shells can be treated to give this appearance. Usually a weak solution of hydrochloric (muriatic) acid and a strong solution of elbow grease are coupled in front of a handful of wire brush for many long hours. Blisters later the shell might look like these fine examples of careful workmanship. But don't despair, mechanical buffers can reduce much of the effort.

Although abalone shells are of some commercial value, the greatest demand is for the muscle, or foot, as it is called. The foot is only one greatly enlarged muscle that has tremendous gripping powers. The ab diver has to move fast because it takes only about three seconds for the foot to become firmly attached to the rock after the ab has been frightened, after which is almost impossible to remove it. Once caught the muscle can be removed from the shell and sliced into steaks. In the grocery market abalone steaks, if they can be found, can run as high as \$8.00 per pound of prepared meat. California's commercial abalone fisheries are on the decline because of over-fishing, which accounts for such high retail prices. Japan currently has substantial abalone fisheries for two to three inch abalone. A private concern in California is exporting two and a half inch red abs to Japan because a 10-year wait for growth to a respectable size appears to be financially unrewarding.

Abalone reproduce by what has been called the "shotgun

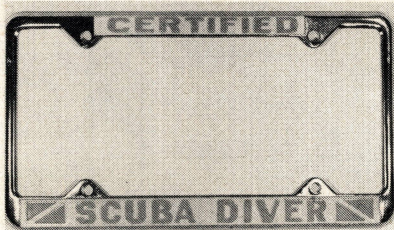
method". The sexes are separate and usually during the summer each sex will release millions of gametes into the water. In the case of the red abs, it appears that less than .000007% will settle and grow to seven inches. Yet the old adage of security in numbers still works. Occasionally an ab will immediately start bleeding when it comes in contact with the ab iron. What has happened is that the ab burst its gonad and released its gametes. Value of this strange response has yet to be determined.

Abs are on the menu for such marine animals as large starfish, crabs, some fishes, octopuses, and sea otters. The otters along California have wiped out nearly all abalone from the Monterey area. These fur-bearing mammals dive with a rock and smash the back of the ab's shell. When the ab falls, the otter is there to catch it.

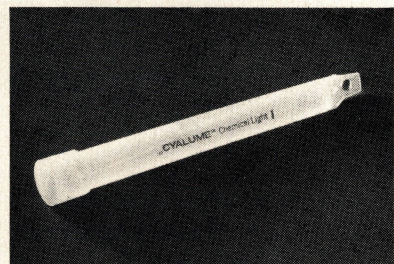
While everyone seems to be eating the ab, what has the ab been eating? Young haliotids make use of minute algae and, as they mature, they move into slightly deeper water and feed on larger algae such as kelp. It is kind of curious to note that sea urchins occupy a similar habitat. Therefore, under natural conditions, where you find one you can expect to find the other, except in some tropical waters and the areas mentioned previously as devoid of abalone. The presence of urchins is the bane of the ab diver. Urchin spines readily penetrate the wet suit and gloves. Steering around the spines and still getting the ab takes some practice.

Diving for abalones is a challenging and rewarding pastime for many thousands of divers scattered over nearly the entire globe. Thus, the place of abalones in the world's diving community is one of great importance. >>>

Identify yourself as a certified diver! These new license plate frames feature divers flags with red on white wording. Make great gifts or club prizes. Durable chrome finished construction. They will fit any car. Priced at: \$2.99 each or \$5.49 a pair (including handling). Contact the manufacturer: Shuttleworth & Co., Box 231, W. Covina, CA. 91790.



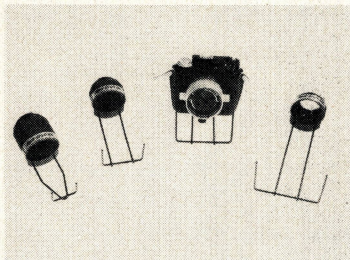
Cyalume® is the new chemical emergency lightstick available from Harvey's line. Compact, self-contained and simple to activate, this unique non-toxic chemical light is ideal for such underwater uses as night diving, cave diving, or wreck diving. While only 6 in. in length, Cyalume® will give off a bright underwater light for up to three hours! \$2. For details, contact: Harvey's Ski/Diving/Surf Suits, 2505 South 252nd, Kent, Washington 98031.



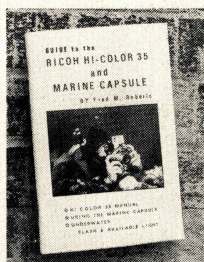
Healthways is now offering their new Scubamaster High Flow Snorkel. The conical belled tip is no mere appearance gimmick. It serves to straighten incoming and outgoing air, promoting non-turbulent laminar flow. Actual tests show that the amount of air moved for a given breathing effort is increased by at least 18% with this. The all rubber, big bore unit retails at \$6.95. Contact: Healthways, Box 45055, Los Angeles, California 90045.



New Gear

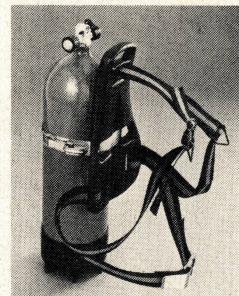


Aquacraft introduces a new line of extension tubes available for making 1:1, 1:2, and 1:3 super close-up photos with the Nikonos camera 35mm lens, and 1:2.75 with the 28mm lens. These extension tubes feature easy-to-turn knurled barrel, streamlined framer mounting, and improved internal anti-reflection surface. Extra "O" rings and replacement frames available. Price: \$49.50. Aqua-Craft, Inc., 3280 Kurtz St., San Diego, CA 92110.



The latest addition to Aqua-Craft's line of photography books is Guide to the Ricoh Hi-Color 35 and Marine Capsule by Fred M. Roberts. The 45-page book, with many illustrations, gives you the basic information you need for the Ricoh Hi-Color 35 camera and the Marine Capsule housing. Test results and tips for the novice are included. The price is: \$2.00. Contact: Aqua-Craft, Inc., 3280 Kurtz Street, San Diego, Calif. 92110.

Healthways is now offering their new Scubamaster Quik-cam Scubapak. The innovative features include a spine groove for bare back comfort, cam-type stainless steel band assembly, three molded handles polypropylene roll-resistant webbing, a new quick adjust/quick release harness assembly, and quick—less than five seconds—draining. \$37. Contact: Healthways, 5340 W. 102nd St., Los Angeles, Calif.



The Sub-Mobile is a new underwater propulsion unit capable of speeds up to three miles per hour. Actuated by a simple on/off hand control, the unit is propeller-driven by silent electric motors, self-contained and powered by rechargeable, space-age gel-cell batteries. Neutrally buoyant, the Sub-Mobile is capable of operating to 100 feet. The unit is 24½ in. long and weighs 30 lbs. Price: \$300. Contact: BBB & W, 1825 Ravine, Kalamazoo, MI.



Glasstar is a new concept in diving watches from Scubapro. The features of this new timepiece are many: self-winding movement, automatic calendar, luminous markings, revolving external bezel, screw-down crown and full guarantee. The jeweled watch movements are encased in lightweight black fiberglass. Price: \$80. For more information, contact: Scubapro, 3105 East Harcourt, Compton, California 90221.

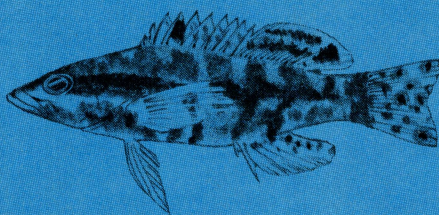




The Harlequin Bass

(*Serranus tigrinus*)

For most people the term "harlequin" calls up mental pictures of Picasso's brightly decorated clowns, mute pantomimists wearing skin-tight, multicolored garbs. This must have been the vision of the ichthyologist who named the wildly patterned harlequin bass, a fish that sports a fair number of spots, stripes and dashes. Because of its imaginative decor, the harlequin bass cannot be mistaken for any other bass in the Bahamas. The dark markings are brown or black, with the light areas white or slightly yellow. Prominent spots near the front and back of the dorsal fin are also noticeable characteristics of the fish. The juvenile harlequin bass has more dark horizontal markings than do the adults. □ In spite of the wild costume, the harlequin bass is very often effectively camouflaged against the ocean bottom. As the fish grows older, the vertical bars become more prominent, nearly forming a vertical line which functions as a stripe that conceals the eye. □ The Serranid family of sea basses contains a rather large number of species which range in size from a few inches and ounces to 12 feet and 1000 pounds. The harlequin bass belongs to the relatively small *Serranus* genus and only grows to about four inches. The small basses are not as easy going as their bigger relatives, and the harlequin bass (called harlequin serranid in early journals) will often dart away at the approach of a diver. Most of the larger serranids stay on or



near the bottom, while the smaller individuals flit about close to cover. □ The harlequin bass will stay near the bottom in the style of its bigger cousins, in grass beds or on coral and rock formations, but it does maintain the flighty characteristics of the little guys. The fish is found in relatively deep water; ichthyologists James Bohlke and Charles Chaplin have collected it between depths of 8 and 80 feet, and they indicated that its range extends from the shoreline to 120 feet. The harlequin bass is found throughout the West Indies,

from Bermuda, the Bahamas and south Florida to Curacao, and off Yucatan. The diver will most likely see the harlequin bass by itself as it roams about the bottom in search of food. The diet of this fish consists primarily of crustaceans, and it also eats some quantity of algae. □ Ichthyological investigations into the private

life of the sea basses have turned up some interesting facts about these fishes. Some serranids are hermaphrodites (male and female at the same time) and are capable of impregnating themselves. One species of *Serranus* is known to do this, but no species have been mentioned for *Serranus tigrinus*. Most basses are only one sex at a time, but do switch, beginning life as females and eventually changing into functional males. Even with these diverse powers of sexual trickery, most basses usually spawn in groups in normally accepted male/female fashion. >

Photo By Carl Roessler/Sea Library-Text By Hillary Hauser

Photo taken in 35 feet of water off the island of Bonaire. Roessler used a Nikon F camera with a 55mm lens, a Bauer strobe, Kodachrome II film, 1/60 sec. at f11, 15 inches from the subject.

Sea-Way Fast-Load SHARK SHOOTER



An Exclusive SDM Product Report

By Jack McKenney

Chances of ever finding yourself in a combative situation with a shark is pretty remote. Even divers who regularly dive so-called shark infested waters rarely have to resort to actually killing one to deter an attack. However, when the situation does indicate an imminent attack, or excessive interest on the part of the shark, it's important to have a defensive weapon that is guaranteed to work.

Rhett McNair, a noted shark expert with considerable reputation as an underwater "bodyguard" for such eminent ichthyologists as Dr. John Randall of the Bishop Museum in Hawaii, found himself in rather delicate situations on occasions when he was riding "shotgun" for some of his colleagues. After a number of misfires with various powerheads he set out to design a foolproof shark weapon.

Over the last few years numerous powerheads have appeared on the market that were designed to kill a shark with surface ammunition. Generally, the early powerheads worked on variations of one design principle. A firing pin at the end of a shaft was enclosed by a sliding breech, which was held in position by a spring. A barrel, which enclosed a standard rifle, shotgun or pistol shell was screwed into the breech. When the muzzle end of the barrel struck a target, the barrel, breech and shell were pushed toward the shaft, causing the firing pin to enter the chamber and fire the primer, which fired the shell. The lead shot, or bullet penetrated the target.

Because this design incorporated moving parts there was often a chance of malfunction due to lack of lubrication, corrosion, or intrusion of foreign matter, etc. Sustained lubrication of moving parts is not practical in a device which is essentially open to a free exchange of sea water as these early weapons were. Neither is a close enough tolerance usually possible under these conditions to preclude the intrusion of foreign matter such as sand, shell fragments, silt, etc. And it took a minimum of about 30 seconds to reload.

In developing a new powerhead, McNair established three design criteria. The powerhead should have no moving parts and it should be self cleaning and fast loading. To these goals he remained faithful, and the result is the Sea-Way Fast-Load Powerhead, a very effective shark defense weapon.

If you look at the photograph of the cutaway you'll see that a firing pin, finely machined from a solid shaft of stainless steel is

screwed securely into a one piece breech and barrel. Tolerances are critical and are kept to within .002 in. during manufacturing. About 3/8" in from the end of the barrel is a groove which holds the cartridge in firing position. Friction points on the shell seat in this groove. When the shell is inserted into the barrel, water is displaced out through the holes at the base of the stationary firing pin. Inside the barrel a layer of non-compressible water actually becomes part of the barrel.

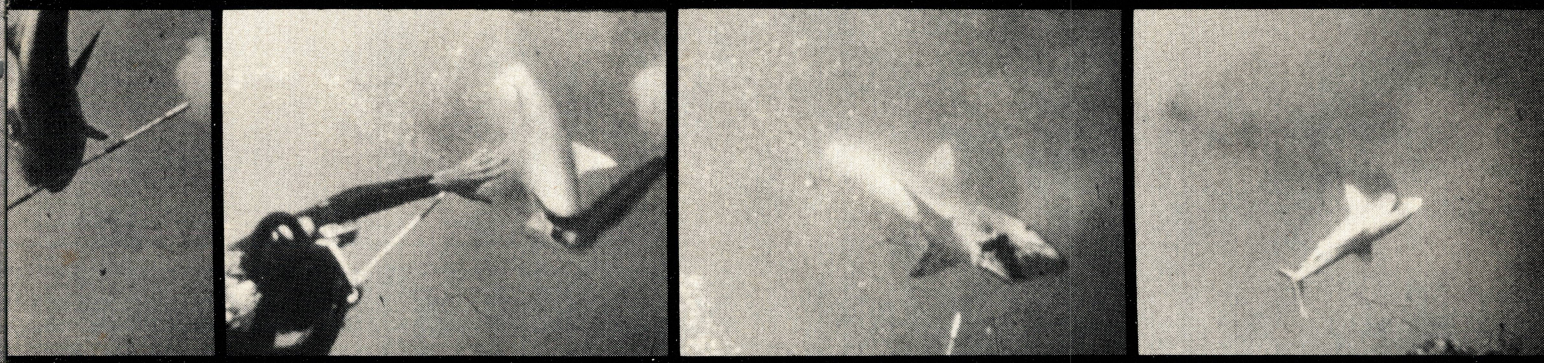
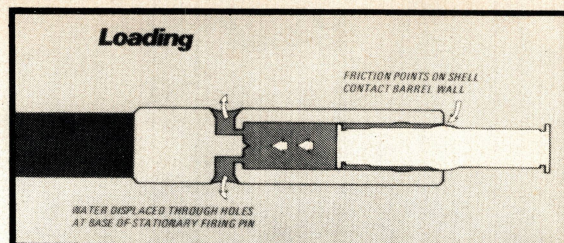
When the powerhead is propelled and contact is made with a shark the shell is pushed against the firing pin, detonating the primer and displacing more water through the rear holes. Detonation of the primer ignites the gunpowder, which propels the main casing forward and into the target, while pushing the rear casing in the opposite direction, seating it firmly on the shoulder at the base of the barrel. This seals the rear of the firing chamber causing explosive energy to be directed forward into the shark. A tremendous pressure build-up in the main casing causes detonation of a powder charge inside the target. Surrounding water pressure causes implosion in the blast area, which creates a suction and draws water in through rear openings, ejecting the remaining shell or primer casing.

Of equal importance to the design and workmanship of the weapon is the ammunition. Another reason for failures in conventional powerheads is that topside ammunition is used, and generally the waterproofing of this ammunition is left up to the individual. Some ammunition (especially some of the shotgun shells) is almost impossible to effectively waterproof because half of the shell may be made of brass and the other half a plastic or even paper base. Water pressure may react differently on the two materials causing a leak at the joint.

The manufacturing and distribution of special ammunition is a difficult and expensive operation, requiring special licenses, special handling, expensive insurance, special machinery and tooling and very special care. But, it insures dependability. The Fast-Load ammunition, which is comprised of two highly modified standard brass shell casings is superior for three primary reasons. First, it is waterproofed to withstand depths to 2000 feet. That simply insures that it is not about to leak at normal depths, even after repeated dives.

Secondly, the shell has more killing power than others because it converts entirely to explosive energy. The shell has no

The shaft of the powerhead is only four feet long, longer shafts proving to be clumsy and unwieldy, present the risk of the shark darting around the weapon to get inside. When the powerhead is propelled and contact is made with a shark, the detonation takes place. Recoil is in direct relation to the density and immovability of the target, concussion intensity problems minimal. The powerhead is a reliable, efficient defensive weapon.



photography by Dr. John Randall

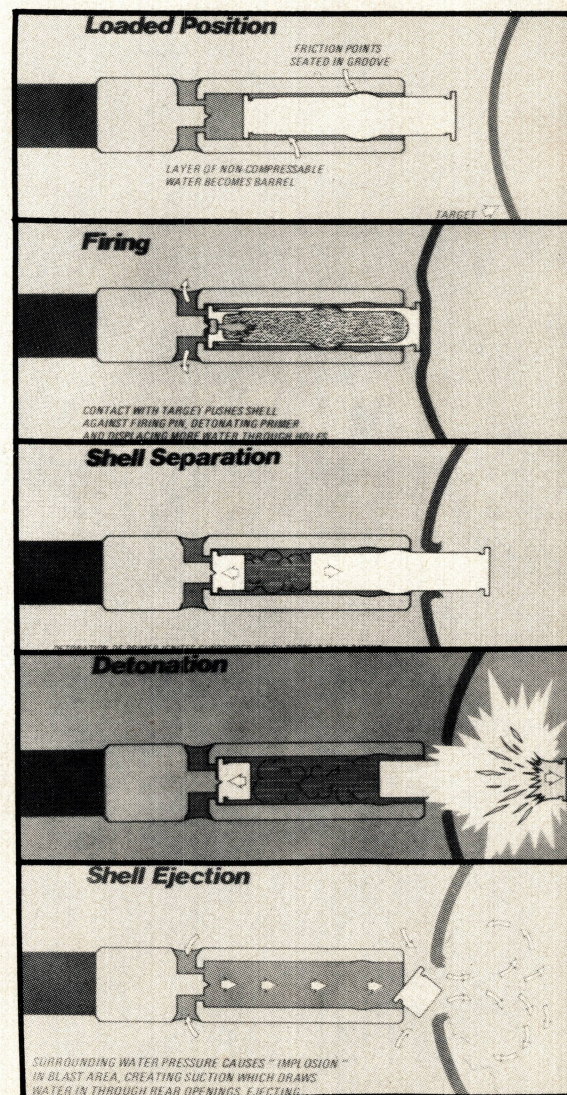
projectile, bullet or shot. The projectile in surface ammunition is transported by energy of the explosion, from the muzzle of the gun to the target. This is accomplished by converting explosive energy into kinetic energy. The price paid for this conversion is the amount of energy expended in moving the lead projectile from point "A" to point "B". A powerhead weapon is already against the target when it goes off, and the best way to utilize its energy is directly. Pure explosive energy destroys a lot of tissue, while bullets merely drill holes. The shell is packed solid with gunpowder. It expends several times the explosive energy of a 12 gauge shotgun shell, and uses it in the most efficient manner possible.

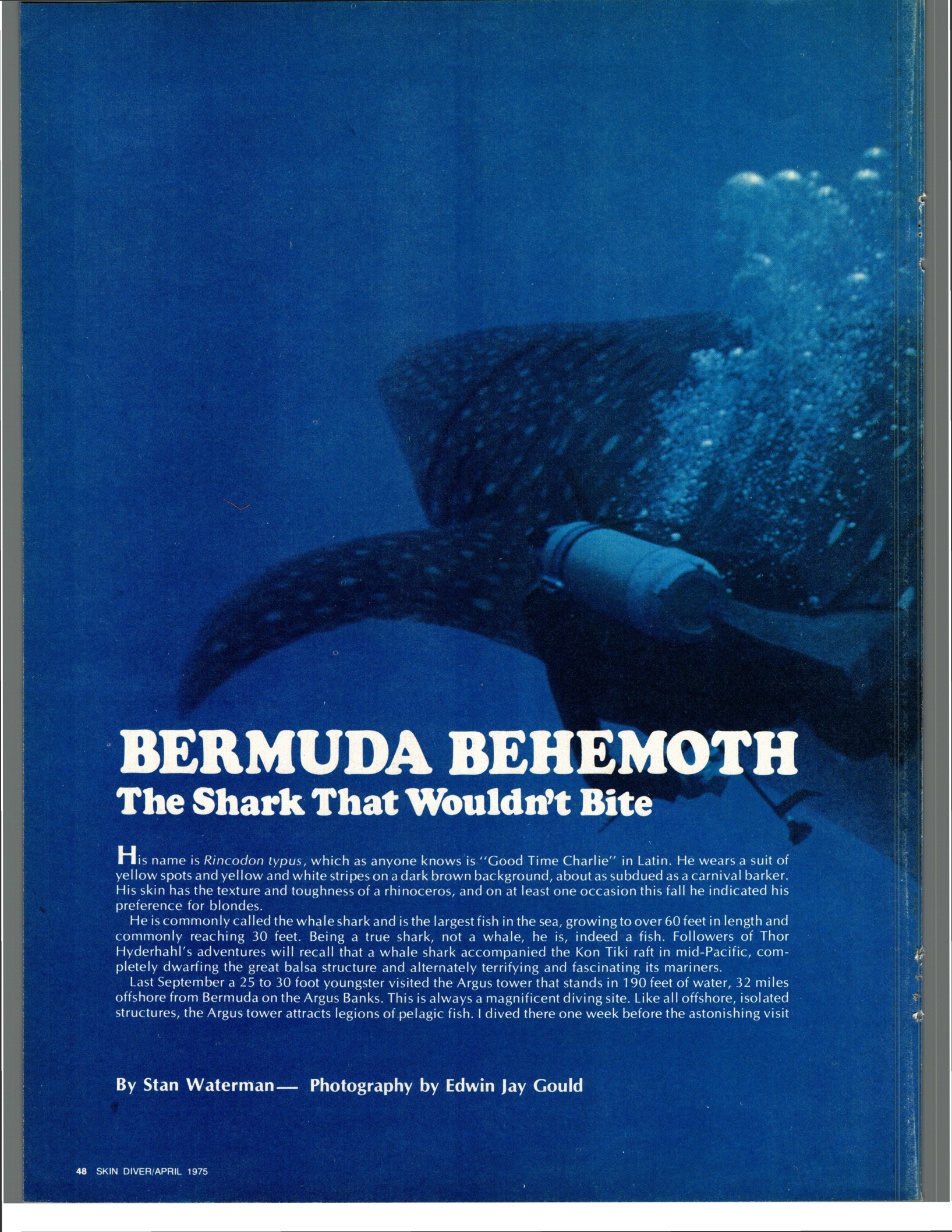
Thirdly, because of the design there is less chance of a misfire. When conventional powerheads strike at an angle there is a good chance the slightly rounded muzzle may slip off the target. With Fast-Load ammo it is the end of the cartridge itself which strikes the target, and this is machined to present a series of annular, sharp edges which will dig in, and grip the target from just about any angle on impact.

The Fast-Load consists of a four foot aluminum shaft with a sling of surgical tubing at the end which is used for propulsion. The weapon is fired by putting one hand in the loop, handshake fashion, stretching the rubber up to the grip and grasping the pole firmly. When the pole is let go the shaft travels forward and on impact fires a shell into the shark. McNair's experience has shown him that shafts longer than four feet tend to prove clumsy and unwieldy and present the risk of a shark darting around the end of the weapon to get inside. Remember the philosophy regarding powerheads is that they are used strictly for defense and not hunting. Therefore, most shark killing takes place in close to the diver.

Most powerheads have a safety which consists of a pin, inserted through the weapon, and essentially prevents the firing pin from entering the chamber. This pin is attached to the shaft by means of a short length of chain, wire, or cord and is pulled out by the diver before firing. It takes about two seconds to reach up and pull the safety pin, but it also only takes two seconds to load a Fast-Load. Conventional types of powerheads are usually carried loaded with the safety in place, but the safety presents another moving part, which can easily be snagged on coral, or lost altogether. It's much safer to carry an

(Continued on Page 62)





BERMUDA BEHEMOTH

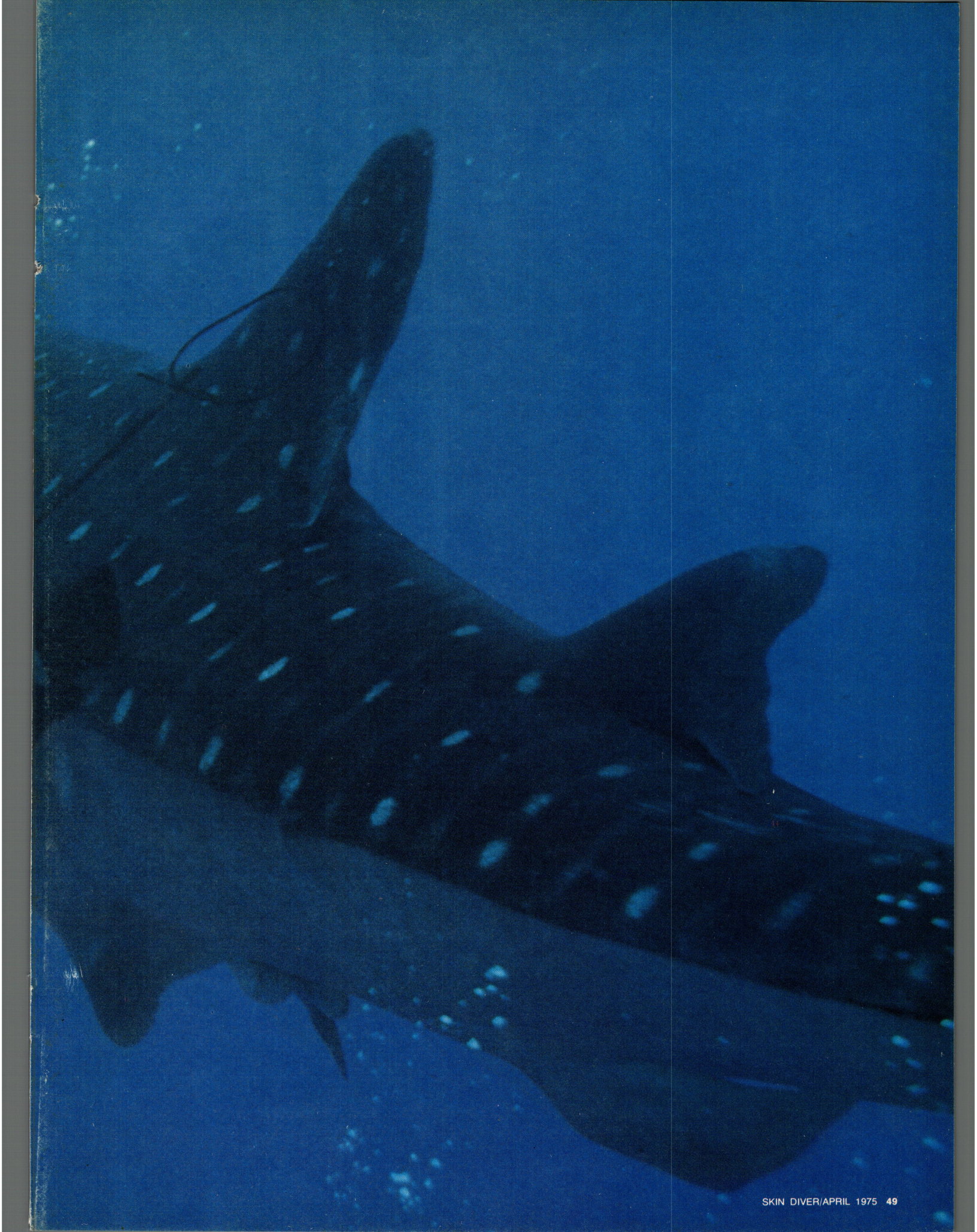
The Shark That Wouldn't Bite

His name is *Rincodon typus*, which as anyone knows is "Good Time Charlie" in Latin. He wears a suit of yellow spots and yellow and white stripes on a dark brown background, about as subdued as a carnival barker. His skin has the texture and toughness of a rhinoceros, and on at least one occasion this fall he indicated his preference for blondes.

He is commonly called the whale shark and is the largest fish in the sea, growing to over 60 feet in length and commonly reaching 30 feet. Being a true shark, not a whale, he is, indeed a fish. Followers of Thor Hyderhahl's adventures will recall that a whale shark accompanied the Kon Tiki raft in mid-Pacific, completely dwarfing the great balsa structure and alternately terrifying and fascinating its mariners.

Last September a 25 to 30 foot youngster visited the Argus tower that stands in 190 feet of water, 32 miles offshore from Bermuda on the Argus Banks. This is always a magnificent diving site. Like all offshore, isolated structures, the Argus tower attracts legions of pelagic fish. I dived there one week before the astonishing visit

By Stan Waterman— Photography by Edwin Jay Gould





He is commonly called the whale shark and is the largest fish in the sea, growing to over 60 ft. in length and commonly reaching 30. He wears a suit of yellow spots and yellow and white stripes on a dark background – as subdued as a carnival barker.

of the whale shark, and recall thousands of horse-eyed jacks and jack crevasses flashing burnished silver in massive spiral columns as far as the eye could reach into the deep blue ocean. The visibility was over 160 feet that day. I know because I could see the bottom from 30 feet below the surface.

When Ed and Sydney Gould, with whom I had first dived the Argus Tower, returned a week later with diving friends, they had another magnificent day. The water was "oily glass calm," as the Bermudians call such a windless day. Sea Quest, the Gould's handsome 44 foot sport fisherman, covered the 32 mile distance in a little over an hour, her bow touching magic springs that triggered showers of flying fish.

Ed and Sydney Gould are both skilled and enthusiastic divers and were most happily accompanied by five other equally avid divers. I say, "most happily," because the experience they would share this day was entirely unlikely and rare.

As the group descended into the cavernous vault of the Argus tower's submarine structure, their eyes adjusted to the shockingly beautiful sight of moving silver against deep, cobalt blue. The jacks were there, a resident merry-go-round.

No one recalls who saw it first. Perhaps there was first just an awareness of another presence. Sydney Gould recalls her stomach turning to cement, her body suddenly charged with adrenalin, her entire being reacting violently to the primordial sense of fear.

A dark, massive form appeared from the fog of distance, just within visual range beyond the tower. Its size was enough to shock any human visitor in the essentially hostile ocean environment. The shape became clearly and ominously defined as it approached. This was a shark; and what a shark! At first impact none of the divers waited to identify the 30 foot leviathan. It may have been a mere youngster in its species, but it was enough to cause cardiac arrest in many divers exposed to such a sudden encounter. The divers beat a hasty and thoroughly disorganized retreat to the stern of the *Sea Quest*. From this secure purchase they watched the monster glide slowly into the precincts of the tower.

From the surface, 45 to 50 feet above, its harlequin design of spots and lateral stripes became clearly visible as did the broad, blunt nose and raised armor-like ridges. Ed Gould recognized it. So did Wolfgang Sterrer, director of the Bermuda Marine Biology Station and one of the incredibly lucky divers that day. Another diver, John Winn of New York City, just freshly certified and having his first real exposure to oceanic diving, hardly dared believe Ed's assertion that the animal was harmless, a nonaggressive eater of plankton and, in fact, an underwater photographer's dream.

The first cautious approaches by the excited divers bore out Ed's identification and description. Not only was this the shark which wouldn't bite; it was also almost evidently a shark which liked people.

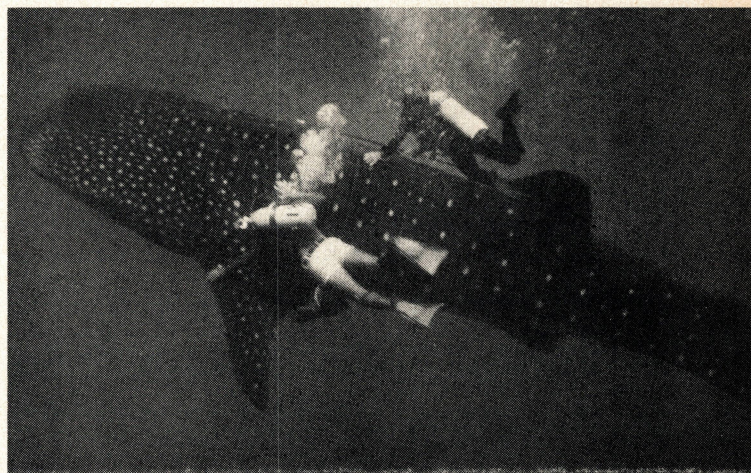
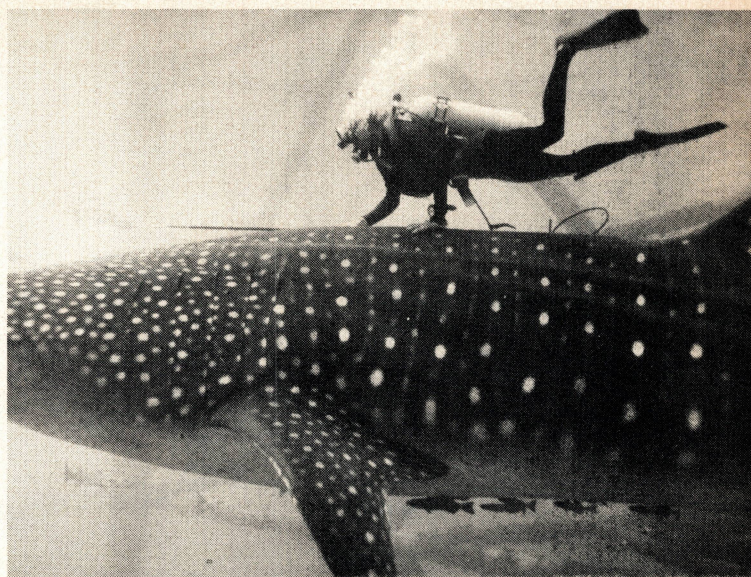
The pictures that accompany this account, all taken by Edwin Gould with his Nikonos, 35mm lens and Subsea Mark 100 strobe, tell the story with dramatic and delightful eloquence. Sydney Gould, naturally exuberant and warm, readily made friends. She rode on his huge dorsal fin, scratched his head, scrutinized his eyeball (amber colored) at eyeball to eyeball range (and swears that he winked). David McLeod, a professional Bermuda diver, providently equipped with a 16mm camera, loaded and ready, fired away with trigger-happy abandon. David and Gail Dickinson, also Bermuda divers, made friends with *Rhincodon*, peered into his mouth, and wondered if future cocktail party credulity would support their story.

And what of the star, the center of all the adulation and fevered lensmanship? He not only appeared to enjoy the attention of the lilliputians, but patiently stayed around through their luncheon break to host their attentions once more as they used up the last of their air in a short afternoon dive. He was still there when *Sea Quest* slipped her mooring to the tower stanchion and pointed home for Bermuda, invisible over the horizon.

Divers may converge on the Argus tower in expectant droves, their hopes fired by this rare encounter. They will not be disappointed by the beauty of the marine world under the tower; but the encounter with the whale shark was — as described above — a very rare one. To paraphrase Will Shakespeare, who wrote "To be honest as this world goes, is to be one in a thousand," I would guess that to encounter a whale shark as this ocean goes, is to be one diver in 50,000.

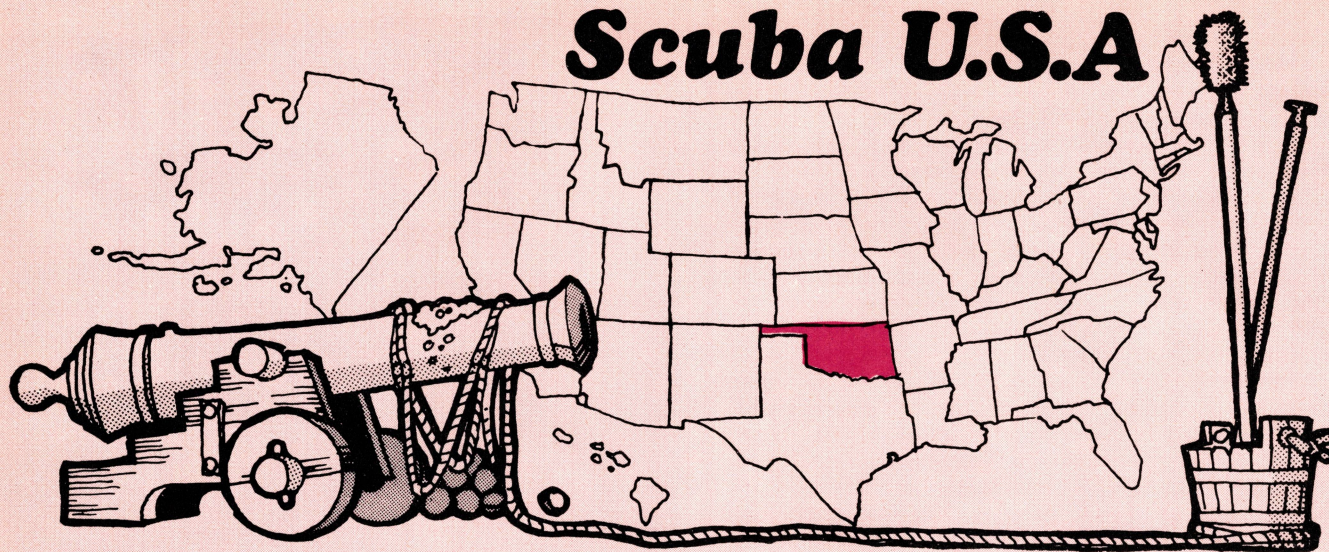
And just to relate to the outrageous luck of the encounter, may I offer this outrageous bit of doggerel:

There once was a blonde from New York
Who smilingly rode on a shark
They returned from their ride
The Lady outside
And the smile on the face of the shark >



Not only was this the shark which wouldn't bite; it was also almost evidently a shark which liked people. Here the divers are making friends, riding on his back. The *Rhincodon* not only appeared to enjoy the attention of the lilliputians, but patiently stayed around through lunch to host their attentions once more as they used up the last of their air in an afternoon dive. He was still there when the boat left for home.

Scuba U.S.A



Oklahoma Divers Drown Dust Bowl Image

By Jerry Jones

Scuba diving in Oklahoma began over two decades ago. The first club was organized in 1952, and many of the original members are still very active divers. Most of the diving activity takes place in a few of our many man-made lakes, one of which is Grand Lake with over 1300 miles of shoreline. Oklahoma, in fact, has the third greatest amount of lake shoreline of all the United States, and lived down the dust bowl reputation of the past a long time ago. Lake diving is usually very interesting, and quarries and small clear streams are often utilized as underwater playgrounds. Often these bodies of water offer very good visibility.

Other than having great quantities of water available, the largest single factor influencing the popularity diving has enjoyed in our state is the sport of spearfishing. National scuba competition has been hosted in Oklahoma many times, including the championships where buffalo, carp, and gar — all rough fish — were hunted. More than once Oklahoma competitors have emerged as winners of the national meets. Even a few U.S.A. world records (some of them saltwater records) are currently held by Oklahoma spearfishermen. For the diver who prefers to put fish on the table, there are adequate amounts of flathead and channel catfish, with a few blues thrown in here and there.

Lake Tenkiller, a beautiful, clear reservoir located about 80 miles southeast of

Tulsa, is by far the most diver-oriented lake in the state. The lake is 165 feet deep in its deepest spot but most of the sport diving is done in the 40 to 50 foot range because of the light conditions. Tenkiller is a man-made lake and spearfishermen stalk their quarry through the "tree-tops," trees that were flooded over during the initial lake building process. Visibility can run as much as 20 feet, though 10 feet is more common.

The lake boasts two dive shops — The Little Store, and Gene's Aqua Pro Shop. Air fills can be obtained at the two dive shops as well as at several air stations located at various marinas around the lake. Although good diving can be had offshore, some of the better dive spots are reached by boat. Divers can trailer their own craft into the lake and use one of the launching ramps at the several marinas. Lake Tenkiller is a state owned park and additional information pertaining to lodging facilities, campgrounds and marinas can be had by writing to: James Bond, Wildlife Conservation Dept., Fairgrounds, Tulsa, Oklahoma 74112.

The largest concentration of divers live in the Tulsa and Oklahoma City areas. Four full service dive shops are found in Oklahoma City, one of which is the Fin House, owned and operated by the author. In Tulsa, which has two dive shops, diving classes are offered at two universities as part of their physical education curriculum. Tulsa University was one of

the first schools in a four-state area to introduce scuba instruction as a college credited course. More recently Oral Roberts University made a scuba course available to its student body. Two YMCA's, several country clubs, and, of course, the local diving clubs also provide classes for the people of Tulsa and the surrounding areas. Although it is hundreds of miles from the nearest ocean, Oklahoma has more than enough scuba classes to go around if one is interested in learning the sport.

Even though spearfishing has been such an important influence upon diving in the state, Oklahoma provides many possibilities for the freshwater photo buff to practice his camera skills. The question most often asked by those who view my underwater photos is, "How deep were you?" Since most of my freshwater work is done in the shallow streams that are abundant in northeastern Oklahoma and the depths of these streams rarely exceed eight or ten feet, my answer of "a few inches to ten feet" seems to disappoint the curious viewer; but of course this should not matter to the photographer if he achieves his desired results.

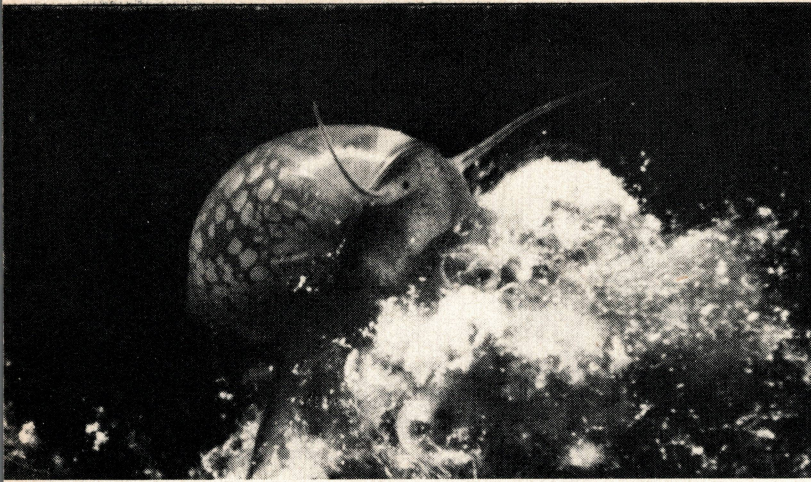
One of my favorite freshwater studios is Spring Creek, a cold, clear spring fed stream approximately 50 miles east of Tulsa, near the town of Locust Grove. To get there, drive due east on State Hwy 33 out of Tulsa for about 50 miles to Hwy 22. Go south on 82 for about four miles.



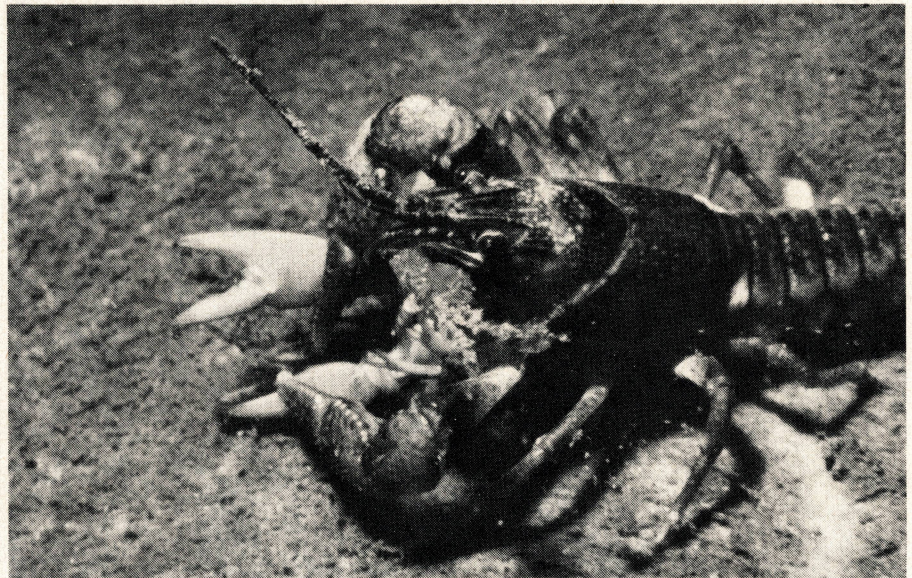
photography by Author

Although scuba diving primarily is linked with the oceans of the world, there is diving done in fresh waters. Scuba diving began in Oklahoma over two decades ago. Some diving activity is found in a few of Oklahoma's many man-made lakes, some in quarries and clear streams. Spearfishing has become quite popular both for food and in competition. For the discriminating gourmet, crayfish can be found to four inches long.





The author has taken some very effective photos in fresh water. Macro photography has allowed this mollusk, for example, to appear much larger than it really is. The minnows are no more than a couple of inches long. It often takes a great deal of time and patience to coax these small creatures into camera range. Other interesting freshwater subjects include: turtles, salamanders, crayfish, frogs.



The creek runs right under the highway and there are a couple of campgrounds where divers may enter the water.

In Spring Creek there are a few "holes" six to ten feet deep; however, most of the creek is one to three feet in depth. Unless there has been a large amount of rainfall, the visibility is always good by inland standards — 25 to 40 feet. Because this stream is spring fed, the photographer will always be more comfortable in a wet suit, even in summer when the temperature is around 70°. The water temperature in winter can drop to the low 40's and even the high 30's. Below the surface, many interesting subjects can be found — small fish (many with striking colors), turtles, frogs, and tadpoles, as well as my favorite subjects — crayfish and salamanders. Often it takes a great deal of time and patience to coax these small creatures into camera range.

The crayfish, crawfish, or if you prefer, crawdad, is a small crustacean found locally in sizes from a fraction of an inch to about four inches in length. In color

they vary from a reddish brown to a greenish tint and if the diver is so inclined, these small "freshwater bugs" can be turned into a delectable delight that would tempt the palate of the most discriminating gourmet.

Another interesting "critter" that awaits the inland photo diver is the salamander. These amphibians of the order *urodela* vary in size and color. While most of them are fairly small, growing to lengths of four to seven inches, the Hellbender, found in the eastern part of the U.S., may grow to one and one-half feet.

Many species of salamanders have external gills in the larvae stage. As the animal matures the gills develop into lungs. This creature, with its feathery gill structures, is an excellent macro subject. In some parts of the world *urodeles* are caught for food but their chief role in nature is to help control insects.

Choosing equipment is important to every photographer but particularly so when the equipment is to be used in freshwater where visibility is more lim-

ited than in saltwater. It is important to use equipment that will focus close to the subject. Most fixed-focus equipment is not satisfactory for use in the limited visibility. The majority of my work is done with a Nikonos camera, various lenses and a Subsea strobe. For our local macro subjects a 2:1 extension tube has given the best results.

The lakes never freeze solid enough during the winter to form really thick ice, so Oklahomans dive all year round. If ice diving happens to be your thing, however, the quarries sometimes have enough ice. Due to the absence of boating activity, underwater visibility in the lakes is usually better in winter. Underwater photography is also improved because cold water causes many subjects to become sluggish and therefore easier to approach. For more information about the Oklahoma diving scene write to: Ed Ralston, Public Relations Officer, Oklahoma Scuba Diving Council, Inc., 3401 N. Meridian Court, Oklahoma City, Oklahoma 73127. 

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SKIN DIVER MAGAZINE

News Briefs

By Hillary Hauser



CORNEL WILDE "TREASURE FILM"

Probably the best underwater adventure type film, and technically the most accurate ever to come out of Hollywood is *The Treasure*, written, produced, directed and starred in by Cornel Wilde. The theme of the story is based around four adventurers seeking and finding treasure, only to lose it to four escaped convicts, who overpower the good guys, while over the treasure site.



Cornel Wilde and Al Giddings confer during shark shoot.

The shark footage (filmed in Australia) is one of the highlights of the film. The fast moving action was filmed by Al Giddings, Chuck Nicklin and Jack McKenney during an expedition to the Coral Sea with Wilde. Veteran diver Paul Tzimoulis remarked after a screening, "the shark action is some of the most exciting I've ever seen. The film should be a great success." Watch for it at your local theater.

ROW, ROW, ROW

A 46-year old New Zealander recently rowed 6300 miles, from Chile to Samoa. Andres Svelundi had planned to reach Australia, but was forced to give up because of stomach trouble. This record row isn't Svelundi's only epic voyage; in 1970 he rowed 5000 miles from Australia to Madagascar.

COIN FIND FIRES UP QUESTION OF DRAKE'S LANDING

An archaeologist has found a rare Elizabethan coin—a silver sixpence dated 1567—at an ancient Midwok Indian village (Rancho Olompali), about 30 miles north of San Francisco, and the discovery has sparked a new debate on where Sir Francis Drake actually landed in California. There have been three sites in the dispute: 1) Point Reyes, north of San Francisco, where a bay has been named Drake's Bay, 2) Bolinas Bay, further south, where there is an ancient fort, and 3) San Francisco Bay, near San Quentin, where a brass plate was found. Rancho Olompali is closest to the San Quentin site. According to a Los Angeles Times report, archaeologist Charles Slaymaker, a UC Extension lecturer who found the coin, has said, "The Tudor crest was unmistakable and the likeness of Elizabeth was unmistakable." Slaymaker undertook an investigation to make sure that the coin had not been planted, is satisfied that it wasn't, but wants no part of the dispute. "A lot of these people have practically laid their whole lives on the line in this Drake thing. I'm trying to stay out of it."

The British Museum is making further analyses of the coin, but critics aren't buying it anyway. They say a coin is extremely portable and tradable and that Slaymaker's coin can't prove that Drake had been to the Olompali village.

According to historical reports, Drake sailed his *Golden Hinde* into a "fit harbor" on June 17, 1579. Francis Fletcher, Drake's chaplain, noted in "The World Encompassed" (published in 1628) that Drake stayed at the spot for 36 days, during which time the crew "built a fort near the shore, repaired the ship, explored inland areas, met and traded with Indians, and erected a brass plate claiming that they called Nova Albion in behalf of Queen Elizabeth." Drake's records were hidden or destroyed, presumably to keep the Spanish from learning of his plans to plunder Spanish ports, and so the precise location of his landing in California has consequently remained a mystery.

QUOTE OF YEAR

There are puns and there are puns. Here's one we heard about recently: Bud Tucker on his KABC (Los Angeles) sportstalk show said that he had seen one of Lloyd Bridges' old underwater adventures, *Sea Hunt*, in which both Lloyd's sons, his daughter and his wife appeared. "That," said Bud,

"was a lot of Bridges under the water."

RESCUE DEVICE

A coupling apparatus has been invented which will rescue U/W vehicles with a tow cable when the vehicle becomes snagged or caught on an U/W obstruction. A patent for the device has been awarded to EG&G, Bedford, Mass.

GULP!

A 25-year-old diver was reportedly swallowed head first by an enormous jewfish in the Gulf of Mexico, but the big fish apparently decided that the rubber-suited human wasn't that tasty and spit him out. The incident, originally described in Louisiana's *Pelican Diver* newsletter, occurred off Malaquite Beach, near Padre Island. The diver, Steve Withers, was scuba diving near some old drilling pipes with a friend, John Beard. Beard reported that a jewfish four feet in diameter moved in and suddenly inhaled his buddy. Withers was so far inside the fish that "not even his fins could be seen." The fish then swam straight for the bottom, 35 ft., and Beard said it disappeared in a cloud of mud. When he had given up hope, Beard surfaced and found Withers in the boat cut and scratched. His tank had reportedly been crushed and his spear was in two pieces. He had no idea what had happened except that he had "felt pinned and all of a sudden loose." The news was related by Beard since Withers was out of town and could not be reached for comment immediately following the gulping.

FISH BOOM

The tropical fish business knows no recession. The industry is doing a \$320 million annual business, with more than 60 million fish and 2.5 million tanks sold each year. Raising tropical fish is now America's third largest hobby, behind coin collecting and photography.

THE DOPE ON DRUGS AND DIVING

Zonked divers are better off if they stay high and dry. That's what a group of Canadian divers recently found after conducting a casual survey of people who had tried to mix diving and grass. According to Ontario's *Diving News*, one group of users smoked one joint (each) and made a dive to 25 feet in clear water in Northern Ontario. The water was 56°, and the divers wore 1/4 in. wet suits. They were forced to come out in just 16 minutes, whereas a normal dive for them at that depth would have been 50 minutes. They also noticed a decrease in breathholding ability. One instructor, an experienced free diver who was normally capable of holding his breath two to two and one-half minutes at 50 feet, could only hold his breath a maximum of 24 seconds at nine feet—after two joints.

The Canadian newspaper also recounted the findings of a group of divers experimenting with the weed in the Bahamas. These divers, said the report, found that in warm water the loaded ones became ultra-relaxed, unaware, lazy, and lost ability to perform work. At a depth of 45-50 ft. one instructor "greyed out," or simply went to sleep.

These findings are rather unofficial, but it shows that divers are beginning to think about it before they light up. Even the question of seasickness drugs is getting some thought. One report we received from Britain stated that anti-seasickness preparations (hyoscine or antihistamine families of drugs) caused drowsiness and sleepiness and increased susceptibility to nitrogen narcosis. The report recommended that divers taking such drugs limit their diving to no more than 40 ft. The hyoscine family (Kwells) "are probably preferable." As with the grass, no official report has been done on the seasickness problem, but in both cases the word now is: cool it.

READERS ARE INVITED TO SEND ITEMS TO NEWS BRIEFS EDITOR HILLARY HAUSER, 8490 SUNSET BOULEVARD, LOS ANGELES, CALIFORNIA 90069

TREASURE WITH STRINGS ATTACHED: JAIL, AND DEATH

A recent rush for ancient pottery aboard a Chinese junk sunk in a bay near the island of Ko Khram, Thailand, has read like something out of *The Treasure of Sierra Madre*. One diver who had vowed never to get mixed up in treasure hunts ended up dead, and two German tourists along for the ride landed in jail. The junk was discovered by local fishermen who were using scuba gear to look for fish near Pattaya Bay. They accidentally came upon the rotten timbers of a Chinese junk, and a collection of plates, jars and pots dating back to the Sukhotahi period. The porcelain pottery began to bring in fair prices in town.

According to Don Ross in the *Bangkok Post*, everyone started diving for the pottery. However, German sport diver Dieter Knoll was quoted as telling his friends: "It is always dangerous and people lose their heads with the thought of riches." Three days later Knoll gave up his tourist charter business and sailed to the area where the Chinese junk lay. He spent many hours diving to 148 feet to bring up the pottery. Two German tourists aboard Knoll's boat, Rudi Mattersteig and Jan Silva, said Knoll would not listen to reason and continued to make his repeated dives. The two made a dive themselves and brought up 17 pieces. A police patrol boat was watching the entire operation, and since Knoll had told the two tourists that the wreck was in international waters, they thought everything was fine. At 5 p.m. that same day, Knoll made his last dive. He took with him two 10 litre tanks and a large net for the pottery. He did not return. Silva and Mattersteig then refilled their tanks and went down to search for Knoll. They found him in the wreck clutching a plate with a net full of pottery anchored by a line to his waist. His regulator was caught in an anchor line, his lungs reportedly burst.

Then Mattersteig and Silva were locked in jail for possessing valuable pottery and they were told that they would have to stay in Thailand until the case went to court. Though other local divers had retrieved many pieces of the pottery, the police said they had not been able to arrest these people because they had "not been informed as to who they were." The two tourists were arrested because someone had telephoned authorities about their activities.

Silva and Mattersteig consequently stayed in Thailand until authorities figured how they would deal with the case. Were the Germans mad? "We are not gangsters but sportsmen," they commented. "We took hundreds of feet of film in the wreck. To us, the fact that we were on the scene of a treasure hunt made our holiday. Sport divers dream of the opportunity."

SHOP LIST

A directory of New England area dive shops is now being compiled by the Bay State Council of Diving Clubs, Inc., to be distributed to divers throughout the northeast later this year. Over 150 questionnaires have been sent to shops in the area, but if yours hasn't received such a form, please contact Bay State Council, P.O. Box 1054, Attleboro, Mass. 02703.

TURTLE LAW

The Calif. legislature has passed a law, effective this year, that will take sea turtles off the endangered list. They can now be sold commercially for meat and oil. The turtles will come from the British West Indies, where firms are experimenting with domestic turtle farms. Conservationists are afraid that the new law will encourage world-wide turtle poaching.

DOLPHIN SCHOOL

The Russians are trying to train dolphins "useful skills" such as carrying messages from divers and underwater habitats to the surface, helping on U/W farms, locating U/W mineral deposits. According to *Ocean Science News*, former professor Andrey Shevelov is running a program at the Batumi Dolphinarium on the Black Sea to teach the mammals first to push a float underwater, then to open a feeding tray and get a fish. Shevelov is also studying dolphin language and the mammal's ability to make decisions.

ODDS & ENDS

NOB (Nederlandse Onderwatersport Bond, or the Dutch U/W Sport Federation), has joined the VBMU (Federation against use of mechanical spearfishing apparatus), an organization founded by Dr. Hans Hass some years ago . . . The parents of a 15-year-old boy who drowned last May while diving off Catalina (Ca.) is suing the boy's scuba school and its instructors for \$850,000. Also named in the suit are the owners of the charterboat which the boy was diving from . . . Sea otters play a significant role in certain marine environments say researchers for the Wildlife Management Institute—especially in controlling sea urchin populations which decimate kelp beds . . . The Oceanic Society (now publishers of *Oceans Magazine*) is forming local chapters around the U.S.; the Tampa Bay (Fla.) area has just formed theirs and invites interested persons to call them at (813) 536-7144 . . . An eight pound salmon swam into the Thames and lived. It was the first one caught in the polluted river in 141 years and officials are "jubilant" . . . The new Ocean Simulation Facility at the Naval Coastal Systems Lab in Panama City, Fla., has been successfully tested to 2250 ft. Manned diving operations were scheduled to commence early this year.

The basic purpose of this column is to stimulate an interest in the technical aspects of diving and will be devoted to providing factual answers to questions from SKIN DIVER readers. Answers will be designed to apply to the majority of diving situations, problems and equipment in use today. Single subject questions are best suited to Technifacts and may be on any subject related to diving. Watch for your answers in Technifacts.

For their questions or comments used in this month's Technifacts I would like to thank Mr. Ned Guardenier, Key West, Florida; Mr. Pairat Bencharit, Bangkok, Thailand; Mrs. R. J. Brink, Tracy, Minn.; Mr. Al Rau, Hastings, Mich.; and Mr. G. Daniel Rostrup, Lindenhurst, N.Y.

Where can I get information on testing and maintenance of all my scuba equipment?—A small Mini-Manual titled *Scuba Equipment Care and Maintenance* is published by Petersen Publishing Co., 8490 Sunset Blvd., Los Angeles, California 90069. The manual sells for \$1.00. It covers most maintenance that might be required and illustrates most of the equipment needed to make the various tests and perform the maintenance and repairs. If more information is needed regarding the manufacturer of equipment used in servicing scuba and related equipment write to the author Mr. Al Thompson, Professional Scuba Repair,

Technifacts from a Master Diver

BY E. R. CROSS

5725 Cahuenga Blvd., North Hollywood, California 91601.

A machine shop (one query regarding test equipment and maintenance equipment owns a machine shop) should be able to fabricate the required equipment if it is not otherwise available.

Feedback on 7 man life raft!—A few issues back Technifacts asked readers for information about the 7-man life raft shown in an SDM article that appeared in the June, 1974 issue. Apparently there are, or were, two manufacturers of these rafts for the U.S. Navy. One reader wrote he had used units that were manufactured as Boat, Landing, CO² Inflatable, by United States Rubber Co., Providence, R.I. under contract B565358, Bureau #S8225 (7) 1298959.

Another reader stated that the UDT boat was manufactured on a government contract by Grand Canyon-Canyonlands Expeditions, P.O. Box O, Kanab, Utah 84741. He went on to add that this com-

pany manufactures both a seven man and a ten man raft. The 7-man unit, designated the Selway, sells (in 1974) for \$650.00. The 10-man unit, designated the Yampa, sold for \$906.00. Interested parties can write manufacturers direct.

Positive I.D. for diver C-cards! — A Technifacts reader wrote, "Suggestion for validating of C-card — We have found a photo on the card, as used on Florida driver's licenses, Master Charge cards, etc., to be the most foolproof way of positively identifying the diver."

This is probably an excellent idea. With Polaroid cameras specially made for taking I.D. photos it could be economical and part of the certification course. The actual lamination of the photo to the card might be done by the supervising and issuing organization such as PADI and NAUI.

How can I increase my breath-holding capacity? — "I am planning to take an expert diver course offered by NASDS this coming summer. One of the requirements for the course is to be able to free dive to a depth of 50 feet." This Technifacts reader went on to say, "Unfortunately I have never done much skin diving and my breath-hold capacity is very limited. Exactly how may I increase my breath-holding capacity?"

The first requirement for breath-hold diving is physical fitness. This can be obtained by daily exercise, preferably

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supervised exercise. Diving is strenuous exercise and poorly conditioned muscles cause an increased demand on the respiratory system. Simply staying afloat, swimming to stay in a desired position for the dive, and then the exertion required to make the dive requires about the same expenditure of energy as running. The problem is compounded by the fact that the dive must be done while breath-holding.

The ability to breathe efficiently, to hold one's breath for prolonged periods, and, ultimately, of attaining and retaining good health is closely related to a person's vital capacity. An article in the Journal of the American Medical Association for June 22, 1964, stated, in part, "Vital capacity involves the depth of exhalation as well as extent of inhalation. In fact, exercise recommended for increasing vital capacity should emphasize the expiration phase. More specifically, increased use of the diaphragm in breathing should be the purpose. Strengthening accessory muscles (intercostals, abdominals, pectorals) and increasing the mobility of the thorax are also factors in developing an efficient breathing pattern, but are secondary in consideration."

Suggested exercises were given in the above article and it should be consulted for more information. You might try your doctor for a copy, or your local medical

library. Once a copy of the article is available your doctor would be of help in getting started on the exercises. Posture and other factors are important.

Once the diver is in good physical condition and has developed breath holding capacity the next step is proper breath-hold diving procedures. This involves, among other things, hyperventilation, prior to and between dives, and proper swimming techniques.

Hyperventilation is absolutely necessary for prolonged submergence while holding the breath. But it should be done moderately. Take several slow deep breaths with emphasis on deep, forceful exhalation. While doing this, if the bottom of the ocean can be seen, pick some object, the target of the dive preferably, and use this for lining up your underwater path. On the last breathing cycle take as deep a breath as possible, exhale forcefully, take a moderate breath and go into the dive.

Type of descent in a free dive can be either a head first or a feet first descent. In a head first dive execute a pike tuck and when your hips are directly over your head raise your legs directly above hips and head. The weight of your legs will now push you underwater. Do not start swimming strokes with your flippers until your feet are underwater. To do otherwise wastes energy and uses up your store of oxygen. Use your arms only

once. That is to help in accomplishing the pike tuck. When your body is in the tuck position take a powerful thrust with your hands and arms to help you down into a straight position. Then place your arms in a feathered position alongside the body and do not count on using them again except to spear fish or take the object of the dive. Use of arms in a free dive uses more energy and provides less swimming help than the legs.

A second method of descent from the surface is the feet first descent. With arms and a moderate scissors stroke with the feet and legs, force your body out of the water, to the waist is adequate, then let yourself sink below the surface of the water. Bend in the direction of the dive and start the swimming stroke toward the bottom or object of the dive. Again, do not use the arms except in the initial maneuver to get below the surface.

Proficient, deep skin diving takes years of practice and conditioning. The skin-diving pearl divers of the Tuamotus do not reach their greatest diving ability until they are in their mid-twenties. And some of them start free diving when they are children. Of course, the best for these great divers is a three to four minute dive to a depth of as much as 165 feet. Very nearly a world's record.

A diving instructor's qualification requirement! — A letter from a Technifacts reader said, in part, "Enclosed please

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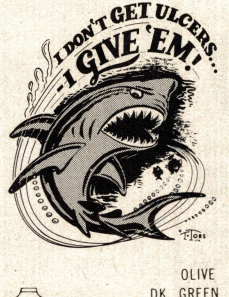
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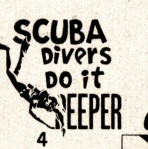
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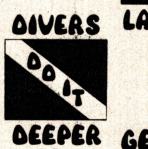
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Technifacts from a Master Diver

find an article showing a requirement for a diving course taught at Southwest State College. We would be very interested in your reaction to this article."

The article and photo in question shows a scuba diver underwater with a bottle of soda in one hand and the caption stated that drinking pop and eating bananas underwater was a requirement to pass the diving course.

It is my considered opinion that such a feat adds absolutely nothing to a diver's ability, knowledge, or experience. And the ingestion of carbonated beverages while submerged might be hazardous. The one thing such qualification requirements can do is provide evidence for writers such as the one who wrote in the L.A. Times that C-cards are "no more of an indication of diver ability than a piece of wallpaper."

Such training gimmicks are usually the product of an instructor who has little if anything to offer diving students and who is grasping for something to make his course "different". I consider harassment tactics of some instructors during their in-water classes only slightly more useful than the above. The instructors would better channel their efforts to teaching students how to never — but never — get in a position or condition that they will have to cope with such childish training stunts.

Will changing a scuba regulator underwater damage the regulator? — This too was a requirement in a supposedly advanced diving class. I suppose, conceivably, there is an extremely remote possibility that someone somewhere might sometime have to change a scuba regulator from one tank to another while submerged. If he, or she, does have to do this it will not damage the regulator. However, the first stage, as well as the second stage and the hoses will probably be full of water and it is important that the diver cause the regulator to free flow prior to the first breath of air from the regulator after it is attached to the second tank of air. If such an exchange is done in salt water the regulator should be disassembled and thoroughly cleaned with fresh water prior to storage.

More on hi-altitude and pressure! — The publication in Technifacts several years ago of the necessity for assuming a theoretical depth (always greater than actual depth) in computing decompression for high altitude dives has created considerable misunderstanding. One instructor erroneously applied the increased theoretical depth to nitrogen narcosis. Now comes a new one. A reader wrote as follows, "Yesterday I was talking to the local dive shop owner in

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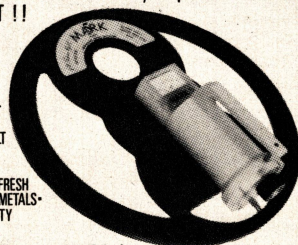
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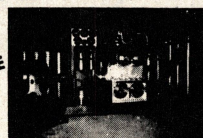


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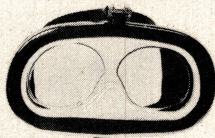


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regard to pressure and its effect on watches at high altitudes. The owner told my brother and me that if you were up 600 ft. in the mountains and dove to a depth of 60 feet in a lake the pressure would be equivalent to 660 feet for the watch and would crush if it were rated for 400 feet. Is what he said true?"

Absolutely not. Actually at an altitude of 600 feet and when diving in fresh water there is slightly less pressure being exerted on the diver, and his watch, than if he were diving at sea level. This is because at altitude there is less air pressure and, in fresh water there is an increase of only 0.435 psi of pressure per foot of depth instead of 0.445 as in sea water. In a dive to 60 feet in fresh water there would be a difference of only 0.6 psi (less pressure) due to the effect of water pressure.

It must be remembered that it is the greatly reduced pressure of the atmosphere at altitude that makes it necessary to assume a theoretical depth for a dive at altitude. The reasoning behind this is that at sea level the atmospheric pressure is 14.7 psi. Atmospheric pressure at the increased altitude is always less. Since decompression tables are computed for sea level atmospheric pressure a diver, surfacing from a dive at high altitude, would be coming into air at less pressure than if he were at sea level. Because of this reduced pressure he might well be stricken with the bends if he did not compensate for the change in pressure. This was covered thoroughly in previous Technifacts and the information is also available as a reprint from NAUI.

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The cost of the clinic is being borrowed at this time, and it is up to the community of Tobermory to raise funds to repay this loan. A special section will be needed to house the chamber.

Divers donations will be accepted by Bettie Smith, General Manager of G & S Watersports Limited, Box 21, Tobermory, Ontario, Can. NOH2RO. Checks should be made to Tobermory Medical Centre and will be presented as a total donation from the diving community.

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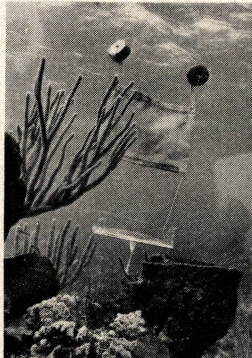
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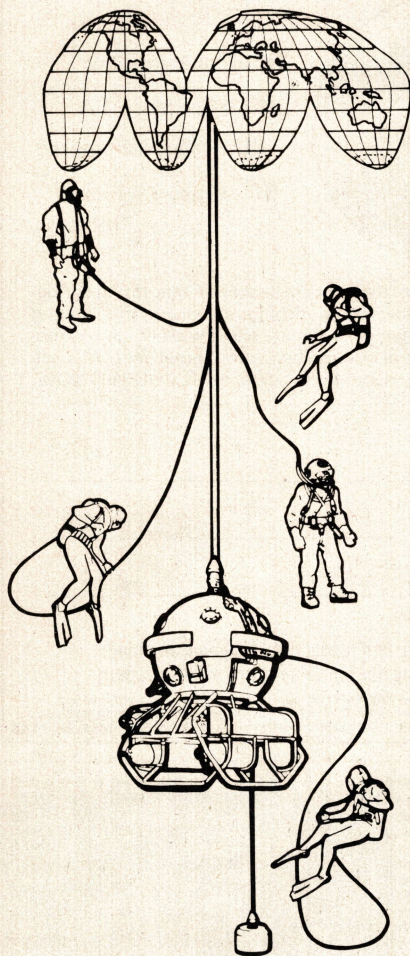
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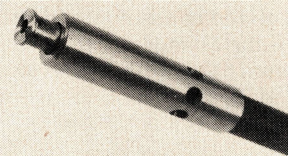
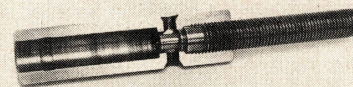
SHARK SHOOTER

(Continued from Page 47)

"unloaded" weapon than one that is loaded and presumed to have the safety intact. A handy leather cartridge clip, which holds six cartridges, comes with the Fast-Load and attaches to one of the diver's belt straps.

As for maintaining it while underwater the Fast-Load can be laid in the sand, silt or mud and immediately cleaned by swishing it around in the water. After diving rinse it thoroughly in fresh water.

Recoil is strictly a relative factor and it occurs in direct relation to the density and immovability of the target. For example, if a powerhead were fired against a solid concrete pier piling, the powerhead itself would become the projectile and would accelerate backward at a high rate of speed. On the other hand, shooting at a small softer target would produce very little recoil, as the force of the explosion would drive forward



Cutaway above shows firing pin and shell chamber. Below shell is in position.

through the target. Complete control of the weapon is maintained at all times because the sling never leaves the hand. The recoil of the weapon usually returns the shaft to the diver's hand and he finds himself holding both the shaft and sling in a relaxed position in his gun hand immediately after a shot, ready to insert a second cartridge with the other hand.

When striking a shark with the Fast-Load it is not a matter of hitting the shark extremely hard to fire the cartridge. The shells have a percussion primer, similar to all "center-fire" ammunition and a percussion primer is not activated by pounds-per-square-inch pressure, but rather by sharpness of the blow. Rhett carried out some experiments where he has demonstrated this by placing an empty shell in the weapon, placed the muzzle against the floor and leaned his entire weight (165 lbs.) on the upright shaft. Upon examination it could be seen that the primer received maximum indentation, but did not fire. He then suspended an ordinary tennis ball from a string and using the rubber sling to accelerate the weapon, successfully fired the primer of a second blank shell against



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the tennis ball. (Rhett has conducted these experiments under very controlled conditions and they should not be attempted by anyone else).

Concussion, or shock waves vary greatly and can range from a barely detectable click to a powerful blow, which feels like a punch in the chest. These extremes are rare and by far the great majority of shots are quite similar in concussive intensity. An average shot would reflect a shock wave which you would feel in your chest and head, but should not be called unpleasant. There have been a few isolated cases of ruptured eardrums from shooting powerheads, but these have generally been traced to people having fragile eardrums. A small target does not absorb much of the energy of the explosion and if this energy is reflected from a nearby surface such as a flat coral face, the bottom, or inside of a cave, and strikes the ear at a right angle, it could damage the tympanic membrane. This is a rare occurrence requiring the coordination of a group of circumstances and all divers should be aware of the possibility, but it should be kept in proper perspective. Rhett has fired more than 2000 rounds underwater under many conditions and has experienced no problems.

At \$97.50 the Sea-Way Fast-Load powerhead is one of the finest made and dependable weapons that can be found on the underwater market today. It's a piece of equipment that a diver may never have to actually use and may only be regarded as insurance. But when it is required to offset an impending shark attack, it's important to have a weapon that lends a little confidence plus a lot of reliability. The Fast-Load meets both of these conditions. It was designed and built by a well-known shark authority and experienced diver who has killed almost 35 sharks in defensive situations. And that's why the weapon was built — strictly as a defensive tool. Extra ammunition sells for \$1.25 per shell. For more information about this quality product write to Sea Way Hawaii, Inc., P.O. Box 19163, Honolulu, Hawaii 96817.

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The University of Miami's Department of Anthropology is offering a four-week summer program in underwater archaeology from June 24-July 25, 1975. The first and fourth weeks will be held on campus; the second and third weeks will be on the site in Roatan, Honduras. Diving certification will be required except for those who wish to do above water support work. Total cost for the summer program is estimated at \$900. To enroll, non-returnable deposits of \$100 are due by April 1, 1975. For further information contact Mike Vavrek, (305) 284-3562, or write P.O. Box 248005, Office of Summer Sessions, University of Miami, Coral Gables, Florida 33124.

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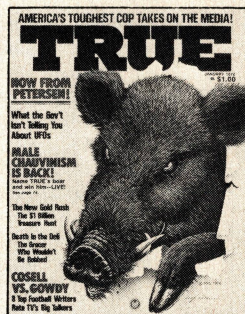
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SDM'S National Scuba Exam

What's your scuba equipment care and maintenance I.Q.?

Answers from questions on page 17.

- 1) C. Providing there is no moisture content, air can be stored indefinitely in a scuba tank. In this state, air is inert, which means that no chemical reaction takes place with the metal cylinder. However, air may taste musty.
- 2) B. Water in a steel scuba tank causes corrosion creating weak spots. If a 72 cu. ft., 2250 psi tank full of air exploded, it would produce enough kinetic energy to equal a one ton weight falling to earth from a height of 5,670 feet. Rust particles may also clog the tank valve and regulator if left unchecked.
- 3) C. Visual Inspection Program. Scuba tanks should be visually inspected by a professional scuba repairman at least once a year to determine the condition of the tank. If there is any sign of corrosion, the tank and valve, and possibly the regulator must be cleaned.
- 4) B. If a tank is stored on its side with moisture in it, a thin line of corrosion may form along its length. The tank bottom is a little thicker and therefore stronger so it should be stored standing up. The tank should never be completely drained of air. Always maintain at least 200 psi in it.
- 5) C. The Department of Transportation specifies that any high pressure cylinder traveling over federal highways must be hydrostatically pressure tested every five years to determine that it's safe to be refilled. Most towns and cities have a local ordinance specifying that D.O.T. regulations must be complied with on any public road.
- 6) B. If a 2250 psi scuba cylinder is accidentally overfilled, or left lying in the sun, so that the air pressure increases to around 3400 psi, a copper burst disc will blow out of the valve allowing the air to escape. This prevents the tank, which is pressure tested to 3,750 psi, from rupturing.
- 7) B. Turning the valve on allowing a short blast of air to escape prior to attaching a regulator will clean the valve opening. This prevents water or dirt from entering the first stage.
- 8) A. Rust in a diving cylinder will cause a brown discoloration to appear on the sintered screen. Because the screen is brass, water would cause it to turn green. Water trapped under a dust cap could also cause the filter to turn green. The tank, valve and regulator should be inspected and cleaned by a repairman.
- 9) B. When high pressure oxygen comes in contact with petroleum products (for example: oil), it may cause an explosion. Air, of course, is used in scuba tanks, but the higher partial pressure content of O₂ may trigger an explosive reaction.
- 10) C. A dust cap should always remain in place between the first stage inlet and the yoke screw when the regulator is not secured to the tank valve. It prevents dirt and water from entering the first stage.
- 11) C. A second stage that leaks water usually means there is a small hole or obstruction in the exhaust valve. An obstruction such as sand particles can usually be washed out. A damaged exhaust valve should be replaced. It can be checked by inhaling with the air off.
- 12) A. A regulator yoke screw should only be finger tight. Air pressure between the valve and first stage will prevent the regulator from coming loose. Because it is virtually impossible to even take the regulator off while under pressure, the tank valve must be turned off and air bled from the regulator prior to dismantling.
- 13) A. Flushing a regulator under warm tap water for at least three minutes will usually dissolve all salt deposits. The first stage ports should be thoroughly rinsed with the dust cap securely in place. When rinsing the second stage be sure the hose and first stage is higher, otherwise water will run down into the hose and into the first stage. Shake all excess water from it and store the regulator lying down.
- 14) B. A regulator should be serviced at least once a year. Worn diaphragms and O rings should be replaced and adjustments made as required.
- 15) C. A submersible pressure gauge indicates the air pressure in a scuba tank when the valve is turned on. It should be used to plan dives and monitor air supply. As with a regulator, it should be serviced at least once a year.

If you got all 15 questions correct, you have a good understanding of how to maintain scuba equipment. If you got more than three wrong, you had better read the instruction booklets again that came with your tank and regulator. There's a handy little book called Scuba Equipment Care & Maintenance published by Petersen Publishing Co., that is available for \$1.00 from most professional dive shops. It also explains how to care for other pieces of dive gear. Next month SDM's National Scuba Exam will feature Dangerous Marine Animals.



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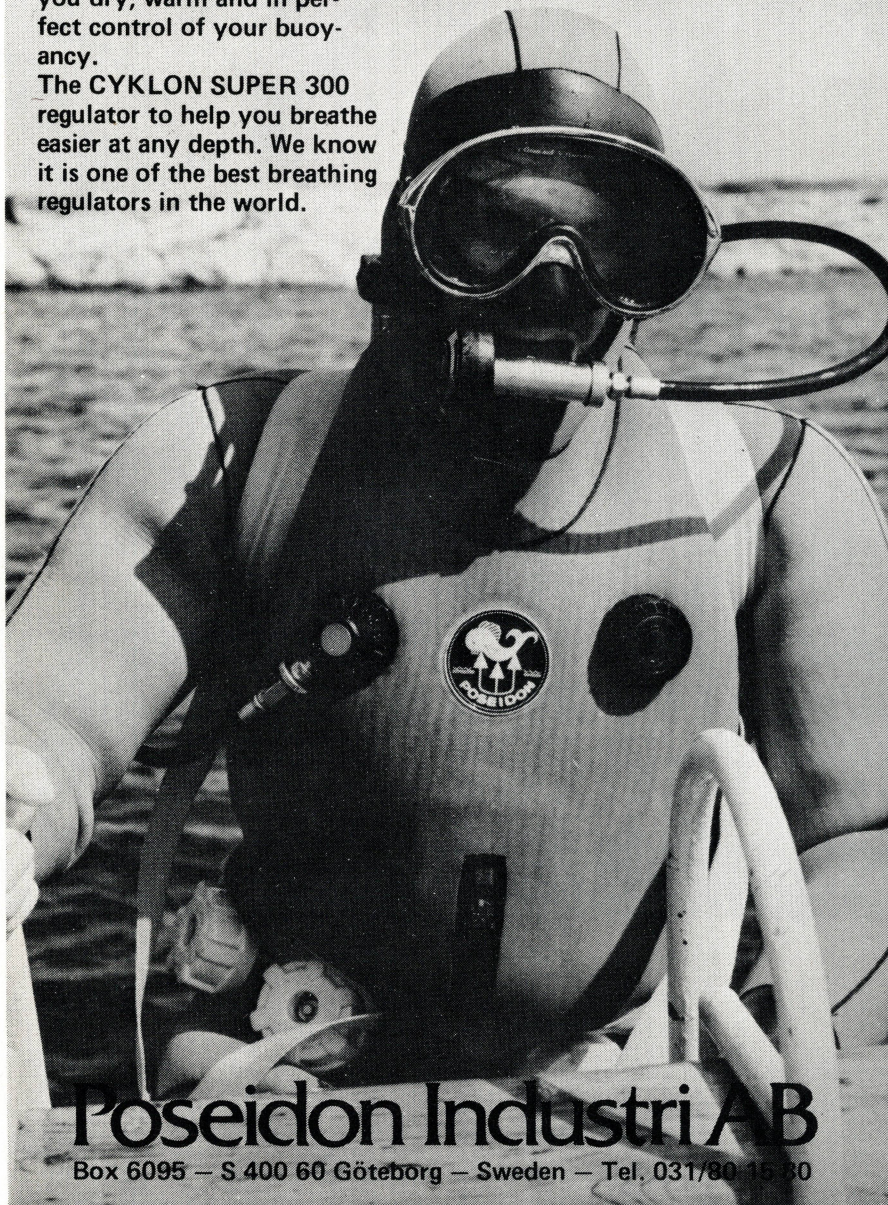
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IUI NORSEMAN

Long Enterprises announces the formation of a new subsidiary — International Undersea Industries. The new company will manufacture hot water heaters, hot water suits and custom wet suits. The hot water systems can be used for both deep offshore diving or a moderately priced system can be used. For the small contractor, Norseman is the trade name of these units. The wet suits are for both amateur and professional divers.

The president of International Undersea Industries is Frank Ledgerwood. Ledgerwood came to IUI from the Naval Electronics Laboratory Center, San Diego. He was Deputy Head of the Operational Support Division of the Fleet Operational Readiness Accuracy Check Site (FORACS). Prior to that, he co-authored a report on the oceanographic and acoustic capabilities of the USS Dolphin at the Navy Underwater Sound Symposium. Ledgerwood is certified in open circuit scuba, semi-closed/mixed gas and closed circuit/oxygen scuba.

Lt. Bill Hemming, USN (Ret.) is the Director of Marketing for International Undersea Industries. Lt. Hemming was with the Navy's UDT units and served in the capacity of divemaster among other assignments. He is a NAUI, PADI and YMCA certified instructor. He holds the title of instructor at Grossmont College.

International Undersea Industries has its own sales force, selling only to jobbers and dealers. The new company's address is P.O. Box 8025, San Diego, California 92102. Telephone (714) 236-1901. Telex 697971. Dealers inquiries are invited.

MORRIS — VOIT SALES MGR.

Tom Morris, Northwest Regional Sales Manager for AMF Voit, Inc., has assumed the additional responsibilities of Southwest Regional Sales Manager. Morris has been with AMF Voit, international manufacturer of sporting goods, since 1969.



In his new position, Morris manages the activities of AMF Voit's sales staff in California, Arizona, Nevada, Colorado, Utah, Wyoming, Montana, Idaho, Washington, Oregon and Alaska. Morris resides in Sunnyvale, Calif.



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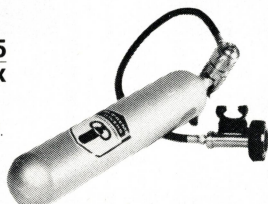
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WENZEL WITH CHAPPELL

Ben Wenzel has been named salesman for the northeastern states from Maryland through Maine, for the A. Jack Chappell Sales, Inc. firm.



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HAROLD JILLSON JOINS NEW ENGLAND DIVERS

Harold Jillson of Gloucester, Massachusetts, has been appointed Sales Manager to the Marine Contracting Division of New England Divers, Inc., of Beverly, Massachusetts. New England Divers is the largest distributor of diving equipment in the Northeast and a leader in the marine contracting field. Headquarters are in Beverly, Massachusetts;



Jillson has been sales representative for two of America's leading diving manufacturers and was a special equipment designer for the Missile Systems Division of Raytheon, Inc. He has been active in underwater research and exploration since 1951, and is a noted scuba diving instructor. He holds a B.S. degree in Industrial Engineering.



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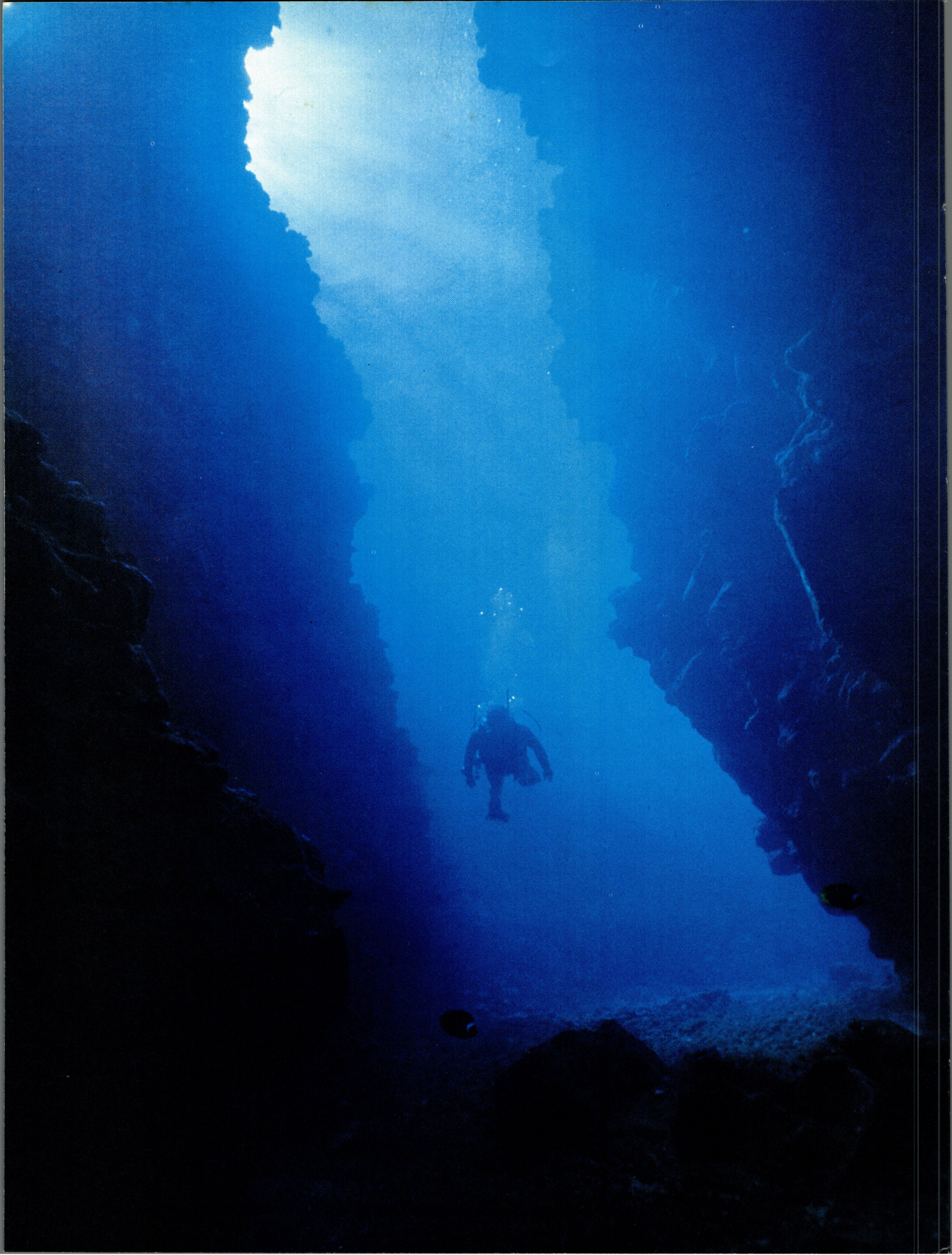
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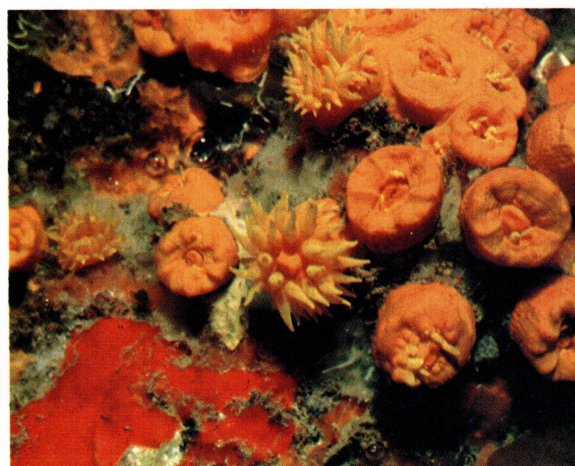
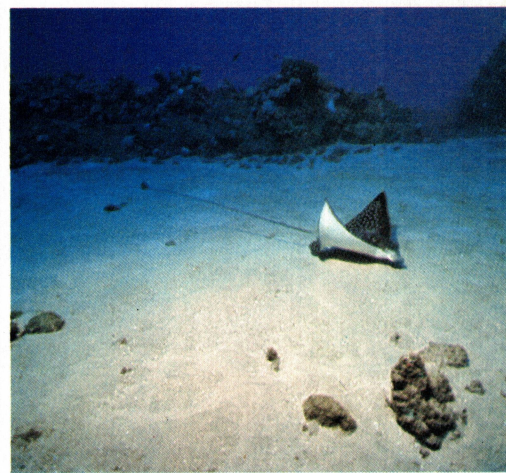
By Paul J. Tzimoulis

Looking for a bargain in diving travel? If so, try the Club Manukai on the island of Lanai. Although it is one of the smallest and least known of the main Hawaiian islands, this little piece of paradise offers big savings for the vacationing diver.

Located some 75 miles southeast of Honolulu, Lanai can easily be reached in 30 minutes or less by a variety of daily flights. It is a small mountainous island some 16 miles in length and 14 miles wide with the highest mountain peak rising up 3300 feet. Few tourists ever visit this island since it has no high-rise hotels, night clubs, or other commercial attractions. Lanai is virtually farm country with a charming atmosphere so typical of rural America in the early 1950's. The main product is pineapple, with 15,000 acres of this delicious fruit planted in the gently rolling hills of Lanai's low country. The rest of the island is mountain wilderness, where deer, sheep, goat and antelope run wild.

Nestled at the foothills of a mountain range lies the island's only settlement, Lanai City. It is a quiet community of 2500 people who are directly or indirectly involved with the pineapple plantation. The streets are unpaved, there are no traffic lights, and most of the people drive jeeps or trucks. The pace here is slow and leisurely and the people are exceptionally friendly.

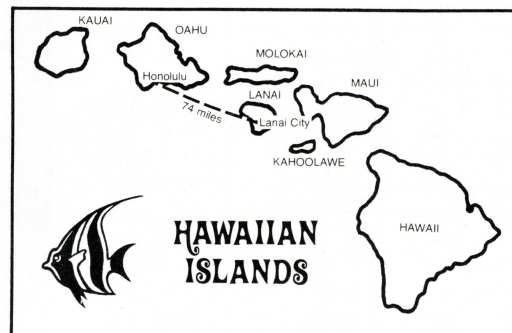
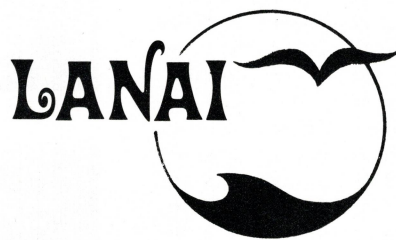
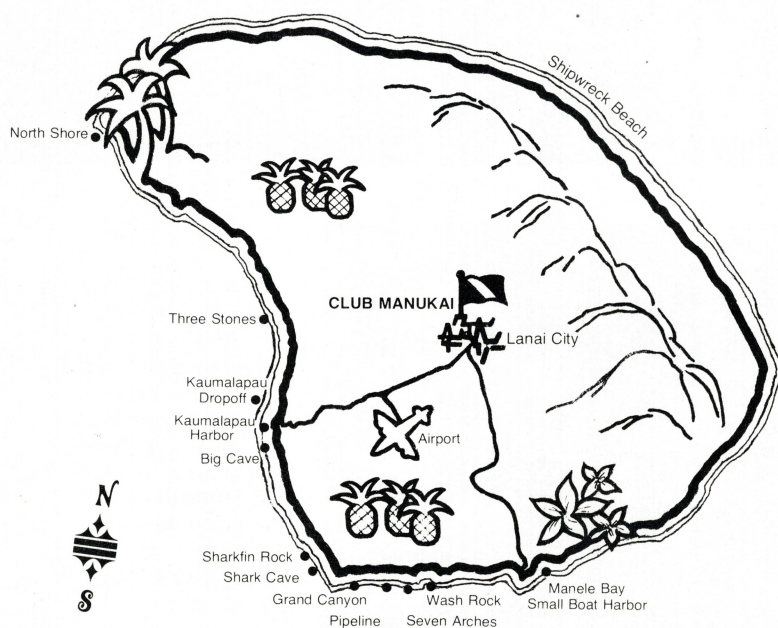
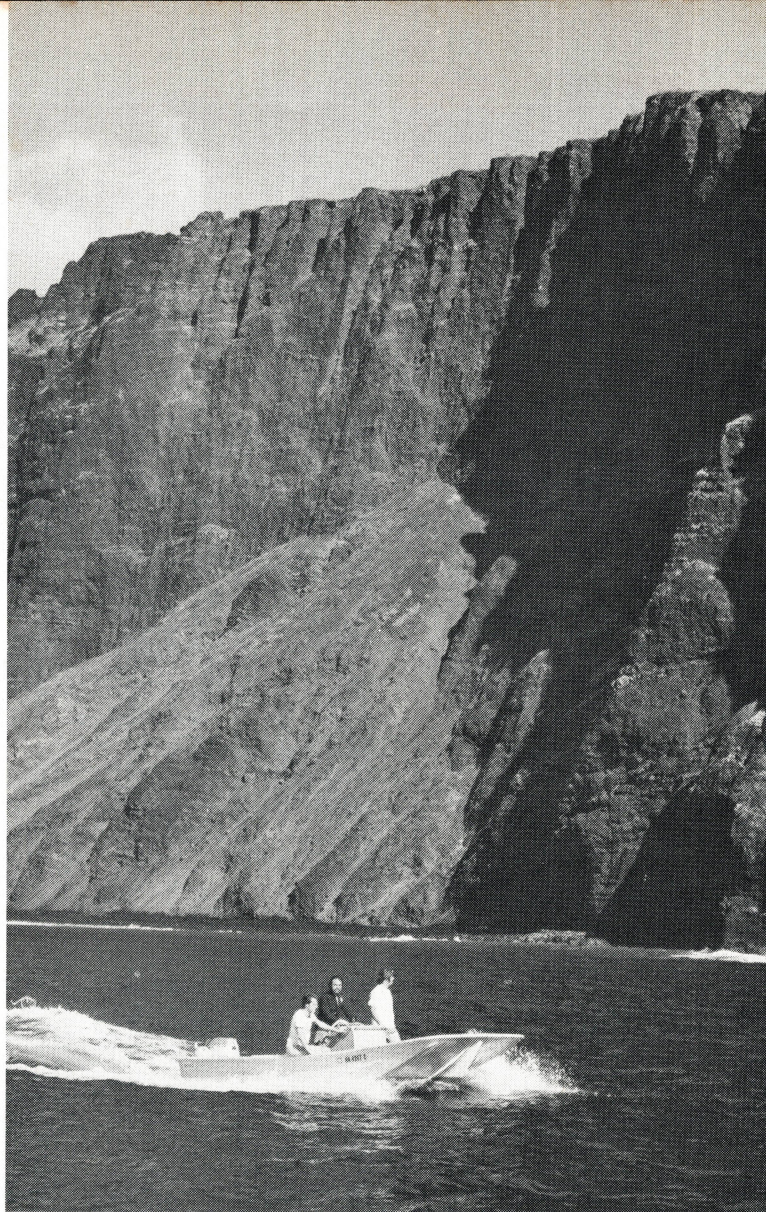
Lanai City is also home and headquarters for Club Manukai, Hawaii's latest and most unusual diving resort. Located at the corner of Houston and 12th Street, stands a rustic, red, three-bedroom farmhouse which has been converted into a guest house for divers. The furnishings are not fancy, but the rooms are spacious and comfortable. Sleeping facilities are dormitory style — four beds to a room. The living room area serves as a combination informal dining area, social center and television room in the evenings. There are two bathrooms, a hot water shower and an outside hose facility for washing down scuba gear. Air conditioning is not needed since the nights are a cool 60 to 75 degrees and you need a blanket for sleeping comfort. The atmosphere is very homey and most dining guests feel as though they are visiting someone's home rather than staying at a commercial hotel. No one bothers to dress for dinner in anything more than a pair of shorts or levis.



Bound to delight even the most traveled diver, Lanai offers a fascinating array of unusual undersea creatures — such as the four-spot butterflies, the Moorish Idols, the eagle ray, and a large crab with the sponge on its back as shown here.

photography by Author

Volcanic cliffs rising straight up from the sea 900 feet offer protection from the trade winds on the leeward coast of Lanai. Surface conditions are calm and visibility ranges from 100 to 200 feet. The majority of dive spots are less than 30 minutes from the harbor.



Adjacent to the guest house is a garage which houses the diving equipment and air station. A 6.6 CFM Bristol Air Compressor serves as the main air pump. It's a quiet running machine powered by a 5 h.p. electric motor. The compressor is hooked up to an air storage bank consisting of five 450 cubic foot cylinders at 2850 p.s.i. Over 2200 cubic feet of air is stored at all times — enough to fill 30 tanks immediately. Integrated into the compressor system is a water separator and a three-part filter. There is also an automatic shut-off switch, and an automatic pressure blow-down switch and a running-time meter. The system is completely automated and puts out a dry, sweet-tasting air supply.

Club Manukai has an inventory of 35 rental scuba tanks, all single 72 cubic foot galvanized steel cylinders. There are a total of 15 assorted tank harnesses, including Healthways, Cam-packs, and Dacor Contour packs. Guests are requested to bring their own regulators, submersible pressure gauges, safety vests and other personal diving equipment. A few spare regulators are kept on hand only in case of emergency.

As for transporting the dive guests from the club house to the boat, a new Chevrolet one-ton flat bed truck has been customized as a dive truck. The vehicle is fitted with tank racks, benches and plenty of room for the dive gear. The trip from the club house to the dock is barely a 15 minute drive.

Club Manukai has two 17 ft. McKee craft open utility dive boats. They are wide beamed and practically unsinkable. One is powered by a 65 h.p. Evinrude and the other is fitted with a 70 h.p. Johnson outboard. Each boat will carry up to six divers plus a boat driver and can cruise at 30 m.p.h. Since the boats are completely open, guests are requested to bring plenty of sun tan lotion or pre-sun lotion, chapstick and a wide-brimmed hat for protection from the sun.

Up to now, Club Manukai sounds a good deal like a dozen other dive resorts which have popped up all over the Pacific islands. But here is the interesting part — the cost for diving, meals, and hotel accommodations is an incredibly low \$37.50 per day, possibly one of the best vacation bargains in the entire Pacific! That's right, \$37.50 per day is the complete price — there are no extras, no tips, nor special fees. The price includes breakfast, lunch, and dinner, as well as two tank dives a day, and possibly a night dive every second day with weather permitting.

Club Manukai, and its unique pricing structure, is the brain-child of Ron McComber, a veteran diver of 20 years. Ron is the perfect image of a crusty old-time diver who can size up a new guest's water ability in a matter of minutes. He

has a booming voice, sun-bleached blonde hair, a ruddy complexion and a reddish-blond beard. He's a power house in the water, swimming for miles without ever tiring or complaining.

Ron started diving in Los Angeles back in 1954. As the sport progressed, he became a certified N.A.U.I. and Los Angeles County scuba diver. Ron moved to Hawaii eight years ago and became deeply involved in diving club and council activities. He served as president of the Hawaii's Divers Club for two years and president of the Hawaii Council of Diving Clubs for one year. His favorite undersea interests are spearfishing and shell collecting and he is now considered an authority on the subject of diving for rare Hawaiian shells.

Ron began diving in Lanai some six years ago. It was one of the few unspoiled reef areas in the Hawaiian islands, unaffected by land developers, commercial industry and dredging operations. The reefs and corals of Lanai were alive and flourishing, untainted by man's pollution. From these early visits, Ron developed the concept of Club Manukai which he finally established in late 1972. He wanted to establish a small intimate resort which specifically catered to experienced divers — not tourists and not beginners. He felt there was a need for a dive resort which could give the experienced diver the kind of advanced diving he desired, but at reasonable prices. Ron also felt the resort operation should be kept small — not more than ten or twelve guests at a time. A small number would help preserve an intimate, informal atmosphere which most experienced divers preferred. It would also help to preserve the ecology of Lanai's undersea reefs since the small numbers would not upset or damage the delicate balance of the marine environment.

Club Manukai is almost a one-man show with Ron doing the cooking, housekeeping, and underwater guide service all in a very cleverly-timed daily routine. He is an excellent cook, and I have yet to hear a guest complain that he didn't get enough to eat. Breakfast usually consists of bacon and eggs, coffee and toast. Lunch is generally two sandwiches, fresh fruit and soda. Dinner is the big meal of the day and this can usually run from baked ham to steak to fresh fish. By keeping the overhead and personnel down to a minimum, Ron is able to offer excellent diving at reasonable prices.

One of the greatest attractions of Lanai is its year-round good diving weather. There is always a lee side of the island which can be dived, regardless of which way or how strong the wind is blowing. Generally speaking, the trade winds blow from the northeast and much of the diving is done on the west and south side of Lanai. Huge volcanic cliffs rise straight

up from the ocean some 900 feet, blocking out the effects of the trade-wind and providing an almost glassy calm surface for easy diving and comfortable rides.

The dive boats are moored at Kaunapali Harbor, a very fine well-protected deep water harbor on the west side of Lanai. This is where the pineapples are loaded onto barges for shipment to the processing plant. The harbor is an ideal departure point for Ron's daily excursions as it is conveniently positioned within easy travel distance from all of the good dive spots on the leeward coast. To date, Ron has located and surveyed at least 60 top-notch dive spots, ranging all the way from the north shore down to Manele Bay on the south coast. He usually visits 10 to 12 different spots over a one week period, thus giving his guests a wide variety of diving experiences. The majority of locations are less than a 30 minute boat ride from the harbor, and many are less than 15 minutes.

The reefs and undersea terrain along Lanai's leeward coast is quite similar to the type of diving found on the Kona coast. The bottom slopes off steeply less than 200 yards from shore into deep blue ocean depths. In many places, the bottom terraces off nicely at depths of 30 to 60 feet with the sea floor carpeted with a wide variety of colorful corals. Close to shore one will encounter an enormous variety of lava tubes, caves, tunnels, caverns and archways — all the result of ancient lava flows which abruptly hardened when they came in contact with the ocean. This myriad of undersea caves offers exciting adventure.

In addition to the impressive beauty of this undersea terrain, Lanai offers a fascinating array of unusual undersea creatures — bound to delight even the most traveled underwater photographer. There are at least a dozen species of moray eels, including the rare dragon moray which has seldom been photographed. Although lion fish are seen and photographed throughout the full range of Indo-Pacific region, Lanai offers a very special miniature variety which is barely one and a half to two inches in length at full maturity. These fascinating little creatures display a marvelous combination of green and red coloration which makes them especially distinctive. There is also a special species of crab which carries a sponge upon its back for camouflage purposes. Octopus, scorpion fish, and turtles are also seen with regular frequency. Another really odd-ball creature is the leaffish . . . a very fragile looking creature which resembles a cross between a leaf and a frog fish. These strange creatures are likely to be seen in yellow, green, or brown coloration, depending upon the color of their surroundings.

Perhaps the most fascinating and most beautiful creature to be encountered in



Locally known as the paddle shrimp, the *Hymenoceros elegans* is perhaps the most fascinating and beautiful creature to be encountered in Lanai waters. Not more than an inch and a half, he is known to attack and kill starfish.



Lanai waters is the elegant shrimp (*Hymenoceros elegans*). Locally known as the paddle shrimp, this little creature is white with burgundy red spots and markings. His two front claws are shaped like ping-pong paddles, and serve a very unique purpose in obtaining food. The elegant shrimp is one of the few species of shrimp known to attack and kill the dreaded crown-of-thorns killer starfish, as well as other varieties of starfish. Although the shrimp is not more than one and a half inches in length, he possesses sufficient strength to flip a starfish onto its back, and then proceed to carve it apart with his paddle-like claws. A close-up photo of this amazing crustacean would be a prize for any underwater photographer's library.

Of the 60 diving locations which Ron has charted, the following is a brief description of the ten most popular spots which are frequented on a regular basis.

SHARKFIN ROCK — Located three and a half miles south of the harbor, this particular spot is well marked by a large rock which looks very much like a shark's fin sticking out of the water. The underwater lava rock formation is approximately 30 feet wide and 80 feet long, with its vertical sides dropping off to an average depth of 65 feet. Visibility is exceptionally clear, averaging 100 to 150 feet most of the time. Sharkfin Rock seems to attract an abnormally great number of tropical fish, and schools of lemon butterflies, wimplefish, and moorish idols are found here all of the time. It is one of Ron's favorite spots for fish-feeding, as well as a good introduction to the reef life of Lanai.

SHARK CAY — Barely 200 yards south of Sharkfin Rock is a lively reef area close to shore which offers excellent reef and cave exploration. The average depth of the water is 35 feet and there are several small lava caves which cut back under the rocky shoreline. The area was named after a white tip shark which was discovered living in one of the caves. There is also a magnificent lava arch in 30 feet of water which is ideal for underwater photography. The Shark Cay area is also the site of large marine tropical fish schools, as well as many game fish. It is ideal for the underwater photographer who is searching for moray eels, octopus, rare sea shells, and other close-up marine subjects. It was at Shark Cay that Ron was able to locate a pair of elegant shrimp for macro photography.

GRAND CANYON — Located another half mile south of Shark Cay is a very unique underwater lava formation known as Grand Canyon. This awesome structure is a sheer walled canyon over 100 feet long with sides that rise straight up 40 feet. The canyon itself averages ten feet wide and depth to the canyon floor is 65 feet. There is a cave on one side which

often harbors big game fish, and there is a small archway near the canyon entrance. Although there are comparatively few marine tropicals at this location, it is an excellent spot for photographing the rare miniature Hawaiian lionfish and the even more bizarre looking leafish.

SEVEN ARCHES — Four miles south of Grand Canyon is still another unusual lava rock formation which offers an entirely different underwater experience. Depths here range from 15 to 45 feet and the bottom terrain is covered with many (more than seven) beautifully sculptured lava arches. The arches are all different sizes and configurations with the smallest measuring six feet across and the largest measuring 15 feet across and seven feet high. It is an excellent area for shelling particularly for the giant Hawaiian tiger cowrie and the lovely trumpet triton. There is also a big lava tube which starts at 35 feet and slants off for 100 feet or more to a depth of 55 feet. You need a good dive light to explore this particular tunnel.

PIPELINE — Close to the Seven Arches area is another spot known as Pipeline. It is named after an old irrigation pipeline on shore. There is a series of lava fingers, or ridges running straight out from shore and spaced approximately 300 yards apart. The most popular finger is a lava ridge measuring 1000 feet in length and 300 feet wide. Depth to the top of this ridge measures 15 to 55 feet and the bottom measures from 45 to 125 feet. The sides of the ridge are sheer vertical walls with lots of little caves, crevices and undercuts. These are particularly well known for their big game fish activity, and you're likely to see jacks, yellow tail, and barracuda in this area.

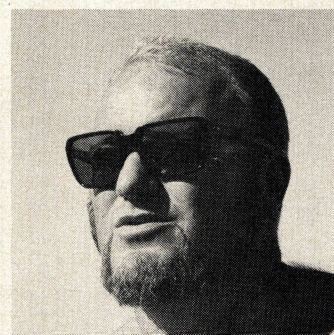
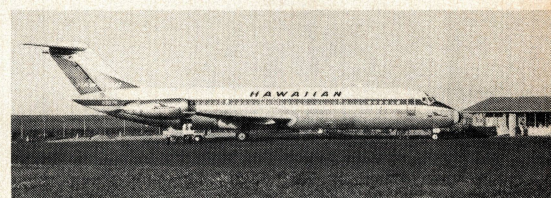
WASH ROCK — Another mile south of Pipeline is a unique lava rock formation known as Wash Rock. This is one gigantic rock measuring 300 feet in diameter at the bottom and 100 feet in diameter at the top. It rises vertically from the sloping bottom right to the surface where it is awash at low tide. Depths range from 55 feet on the inshore side of the rock to 125 feet on the offshore side. The rock itself is covered with tons of live coral growing on all sides. There are also lobsters, rare sea shells, small morays and other tropical fish. A big school of zoster butterflies are generally found milling around on the surface area of the rock.

BIG CAVE — Big Cave could be better described as a giant shallow water lava cavern which is ideal for the beginning cave explorer. It has four different entrances and sufficient available sunlight so that an underwater handlight is not required for finding your way out. However, a light is recommended so that you might better enjoy the interior of the cave as the walls are covered with candy yellow encrusting sponge. Depth to the

floor of the cave is 30 feet and all four entrances are large enough for easy entry and exit. It is an excellent area for shelling or close-up photography. Specific creatures to search for include the miniature Hawaiian lion fish, slipper lobster and small moray eels. Big Cave is located only 300 yards south of the harbor and takes about two minutes to reach by boat.

KAUMALAPAU DROP-OFF — One of the most spectacular underwater dives at Lanai is located just outside the entrance to Kaumalapau Harbor. The top of the reef averages 15 feet in depth, and drops off steeply to a depth of 150 feet. It is one of the few vertical drop-offs on Lanai, and is really a sensational site since the visibility generally ranges from 150 to 200 feet. The face of the wall is etched with an amazing variety of caves, terraces, crevices and undercuts. One could spend hours exploring all of the nooks and crannies of the reef. There is one particularly large formation at a depth of 50 feet which is called the Grand Arch. This particular lava formation is easily 40 to 50 feet wide. Kaumalapau Drop-Off is always active with fish life and marine creatures, thus providing the underwater photographer with a myriad of interesting subjects. There is a large school of zoster butterflies on the top of the reef and a school of lemon butterflies on the 25 foot terrace. Moray eels can be found here by the dozens and you are very likely to find an odd-ball species of crab which carries a yellow sponge on its back. There are also

Club Manukai on the island of Lanai is the brain-child of Ron McComber, a veteran diver of 20 years, and a certified N.A.U.I. and L.A. county scuba diver.



scorpion fish, octopus, and several species of rare marine tropicals.

THREE STONES — Two and a half miles north of the harbor is a shallow water reef marked by three stone pinnacles rising straight up from the shore. These rock pillars are over 50 feet high and can be easily sighted from the boat. Depth of water ranges from 20 to 35 feet and the bottom is covered with black sand. It is an excellent area for shelling particularly for cowries and augers. There are also several good coral ridges and one very large lava archway.

NORTH SHORE — This is perhaps the most distant dive spot on Ron's list for it lies almost ten minutes to the north of the harbor and takes 35 minutes to reach. However, North Shore is one of Ron's favorite dive sites for the fish life is so prolific in this area. Depths range from 30 to 125 feet and the bottom terrain includes many caves, ridges, and sand

reefs. The reef area is spread out over one quarter mile or more. There is a big seven foot long stainless steel anchor embedded into the coral reef at a depth of 50 feet. The marine life activity in this area includes large sea turtles, weighing 200 pounds or more, beautiful eagle rays and sometimes large mantas, as well as schools of big game fish — including the mighty mu (stripped porgy). The deeper reefs abound with black coral.

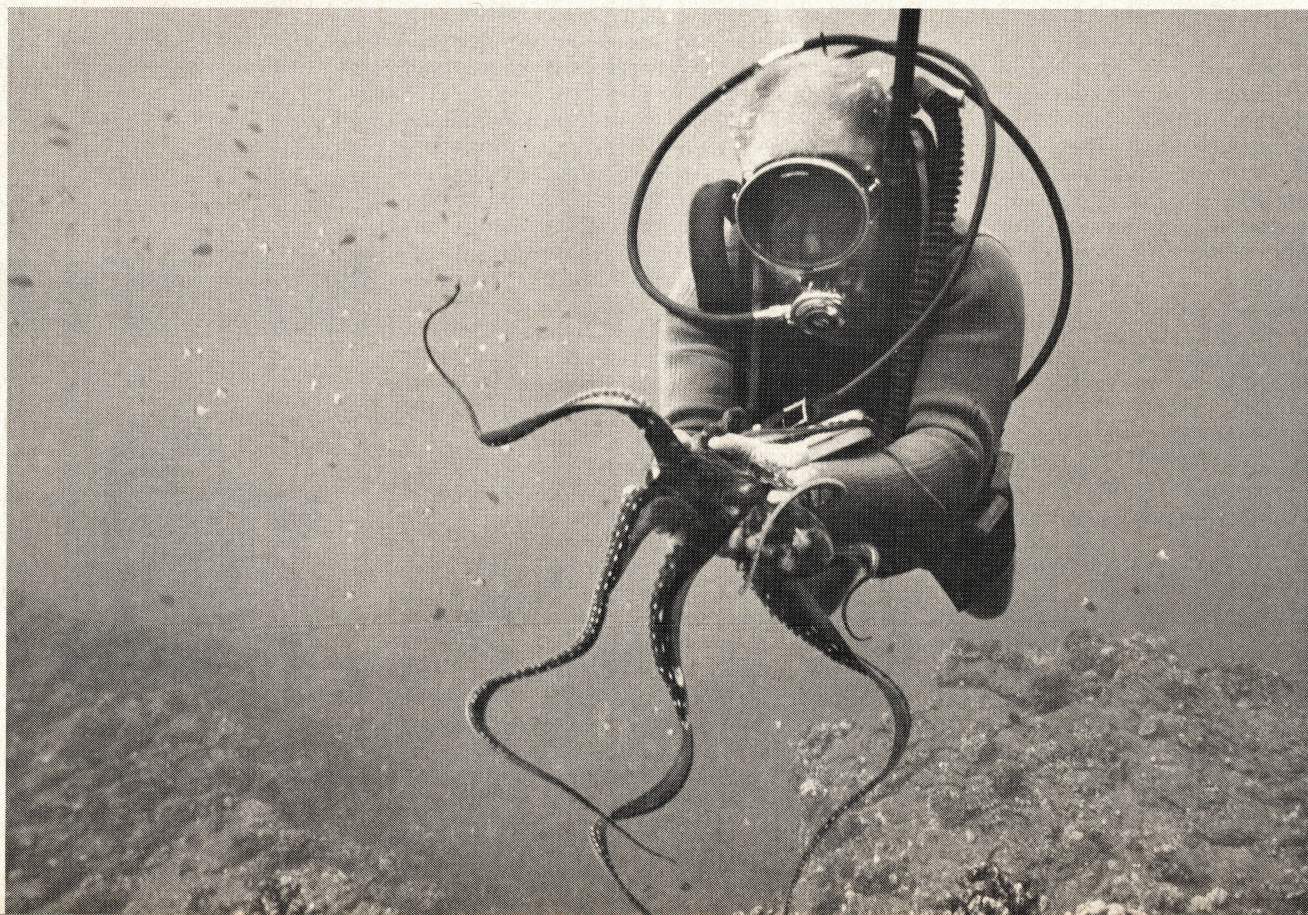
In addition to the above described locations, Ron has many variations of these same spots by simply going into a little deeper or a little shallower zones. The variety of reef formations and marine life is almost endless and many guests return to Lanai for a second, third, or even fourth visit — usually in quest of some rare or unusual sea creatures which they missed on earlier dives. The night diving is equally exciting since guests have an opportunity to see and photograph many

creatures which do not come out during daylight hours.

Although Lanai is one of the more obscure of the Hawaiian Islands, it is amazingly easy to reach. Three different airlines operate daily flights from Honolulu to Lanai with flights starting as early as 5:45 a.m. and as late as 3:25 p.m. In fact, you can make excellent connections from the mainland thus making the entire trip in one day. For example, Continental Airline flight #603 departs from Los Angeles at 9:30 a.m. and arrives in Honolulu at 12:59 p.m., allowing two and a half hours to connect with Hawaiian Air's afternoon flight which departs for Lanai at 3:25 p.m. There are also good connections from Chicago, San Francisco, and Seattle. The same is also true of the return flights.

However, the big problem is getting your hotel reservation in early. Club Manukai can only handle a maximum of 10 or 12 divers at a time, and reservations must be made well in advance. In view of the good diving available and the attractive prices, Club Manukai is bound to become very popular overnight. If you are interested in making a booking or obtaining more information, you can write to Ron McComber, Club Manukai, Houston and 12th Street, Lanai City, Lanai, Hawaii. If you're in a hurry you might want to call him at (808) 565-7415. The best time to call is in the evening from dinnertime on. If you're looking for good diving at good prices, try Lanai, you won't be disappointed.

An expert on the reefs and creatures of Lanai, Ron McComber delights visiting underwater photographers with rare undersea subjects for pictures. Here he captures one of Lanai's many octopi for his camera-carrying guests. A myriad of undersea caves also offer exciting adventure. The caverns harbor lobsters, lionfish, rare shells.



CORAL SEA ADVENTURE

The noted underwater cinematographer Al Giddings will lead See & Sea's 1975 Australia/Coral Sea Diving Adventure scheduled for October 21 to November 6.

Giddings' underwater films have been featured at innumerable film festivals as well as appearing on Network Television. His most recent major film on the sunken Japanese submarine I-169 is slated for the television screens during the coming season with John Wayne



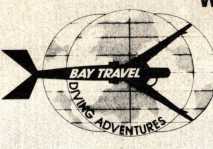
co-narrating. His next project is a National Geographic-Anglea television special on the coelacanth (the fish known as the "living fossil") to be filmed on location in the Indian Ocean.

After two days in Sydney, the group will fly 800 miles north to Queensland and board the superb diving cruiser *Coralita*. This 89 foot air-conditioned boat features gourmet food and wines, spacious quarters and some of the finest diving in the world. For twelve days the group will cruise the crystal waters of Marion Reef, diving on the enormous pinnacles of coral which jut from the floor of the lagoon. For further information, contact See & Sea Travel, Inc., 680 Beach Street, Suite 340, San Francisco, California 94109.

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Bert and Jacki Kilbride, owners of Dive BVI are expanding their business in the British Virgin Islands with the recent purchase of a 25 foot Alglas open dive boat. The boat has complete equipment for eight divers. The Kilbrides have also added a new 8cfm Mako compressor for quick convenient airfills at their new dive shop, located at Yacht Harbour Shopping Center on Virgin Gorda in the British Virgin Islands.

Operating the shop and working as dive guide is Di Dieter, a veteran East Coast wreck diver, YMCA and PADI certified scuba instructor and former field rep for the National YMCA in New York. Dieter was a diving instructor at Central Skin divers on Long Island for four years. For information write to Dive BVI, Box 40, Virgin Gorda, British Virgin Islands.



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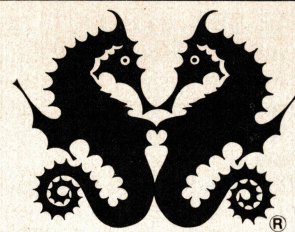
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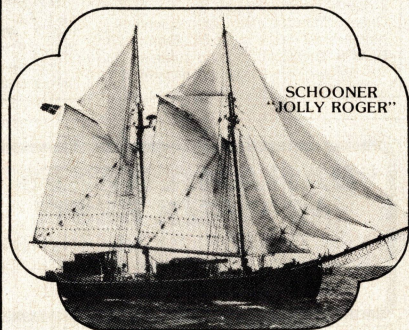
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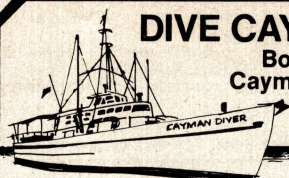
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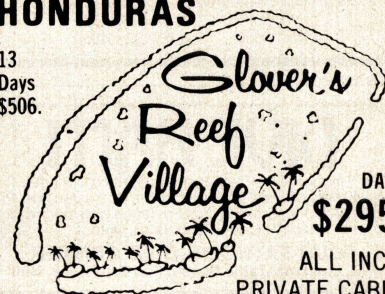
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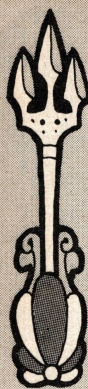
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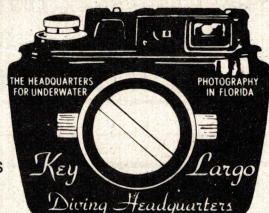
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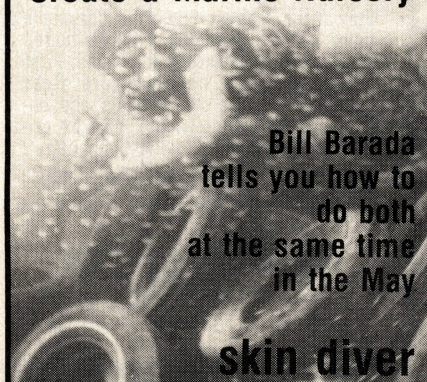


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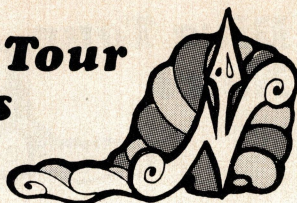
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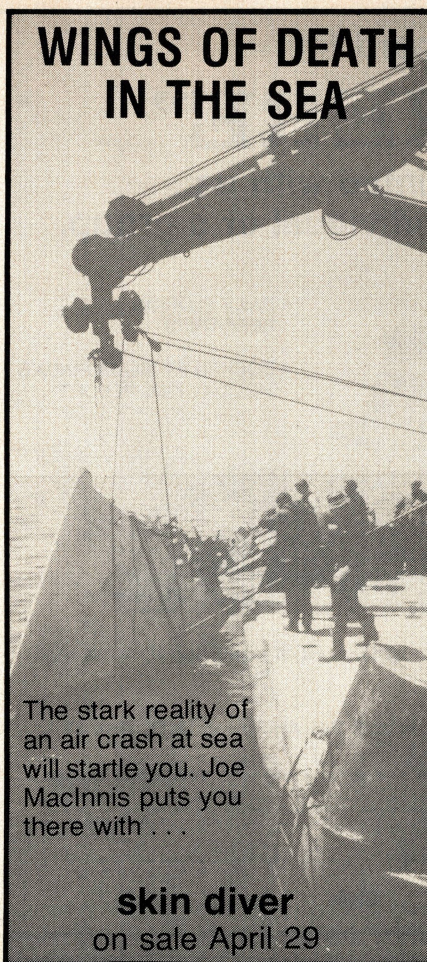
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Dive Tour News



- Apr. 3, 10, 17, 24 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
 Apr. 4, 11, 18, 25 — BONAIRE — 8 days, Lisind Int'l, New York, N.Y.
 Apr. 5, 19 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
 Apr. 5, 19 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 Apr. 5 — COZUMEL/YUCATAN — 7 days, See & Sea Travel, San Francisco, Calif.
 Apr. 5 — BIMINI — 8 days, Lee Turcotte, Atlantis Safaris, Miami Shores, Fla.
 Apr. 11—COZUMEL/AKUMAL—8 days Sunland Int'l Tours, Beverly Hills, Calif.
 Apr. 12, 21 — BIMINI — 7 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
 Apr. 13, 27 — COZUMEL — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 Apr. 14—CABO SAN LUCAS—5 days, Sunland Int'l Tours, Beverly Hills, Calif.
 Apr. 19 — ROATAN — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 Apr. 19 — BONAIRE/CURACAO — 8 days, See & Sea Travel, San Francisco, Calif.
 Apr. 20, 27 — BELIZE — 7 days, Go Mexico, Inc., Minneapolis, Minn.
 Apr. 26 — CAYMAN ISLANDS — 7 days, See & Sea Travel, San Francisco, Calif.
 Apr. 29—CARTAGENA, COLOMBIA—10 days, Sunland Int'l Tours, Beverly Hills, Calif.
 Apr. 29 — TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, Virgin Islands
 May 1, 8, 15, 22, 29 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
 May 2, 9, 16, 23, 30 — BONAIRE — 8 days, Lisind Int'l, New York, N.Y.
 May 3 — AQABA, JORDAN — 14 days, Carl Roesler, See & Sea, San Francisco, Calif.
 May 3, 17, 31 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
 May 3—COZUMEL/YUCATAN — 7 days, See & Sea Travel, San Francisco, Calif.
 May 10 — ROATAN — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 May 10 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 May 11, 25 — BELIZE — 7 days, Go Mexico, Inc., Minneapolis, Minn.
 May 12, 23 — FREEPORT — 7 days, Skeet LaChance, Adv. Cruises, Ft. Lauderdale, Fla.
 May 13, 27 — TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, Virgin Islands
 May 16 — HAWAII — 10 days, Arnold Stollar & Roy Damron, UNEXSO, Pompano Beach, Fla.
 May 16—COZUMEL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
 May 16—CHINCHORRO REEF—13 days, Sunland Int'l Tours, Beverly Hills, Calif.
 May 24 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
 May 24 — CAYMAN ISLANDS — 7 days, See & Sea Travel, San Francisco, Calif.
 May 24 — BONAIRE/CURACAO — 8 days, See & Sea Travel, San Francisco, Calif.
 June 5, 12, 19, 26 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
 June 6, 13, 20, 27 — BONAIRE — 8 days, Lisind Int'l, New York, N.Y.

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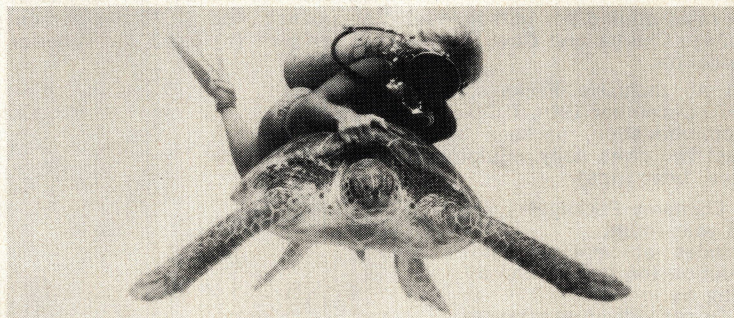
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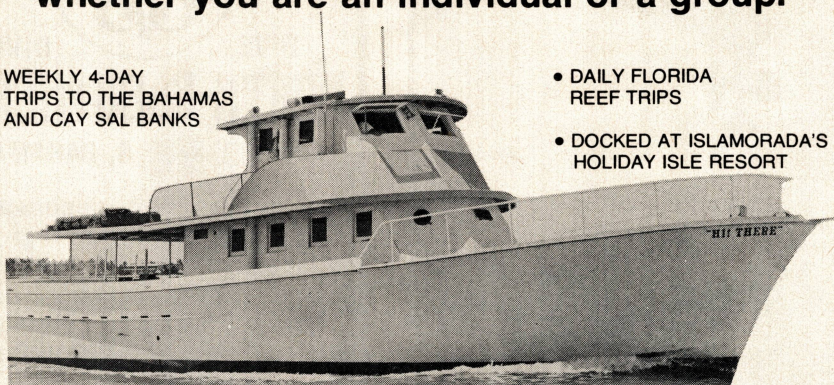
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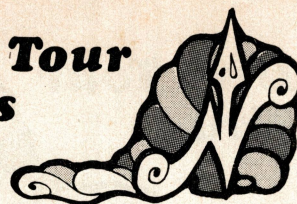
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Dive Tour News



- June 7 — ROATAN — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- June 7, 28 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- June 7 — COZUMEL/YUCATAN — 7 days, See & Sea Travel, San Francisco, Calif.
- June 8, 22, 30 — COZUMEL — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- June 10, 24 — TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, Virgin Islands
- June 10 — BIMINI — 10 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- June 11 — GALAPAGOS ISLANDS — 17 days, Stan Waterman, See & Sea Travel, San Francisco.
- June 12 — GALAPAGOS — 24 days, Sierra Club Outings, San Francisco, Calif.
- June 13 — GRAND CAYMAN — 7 days, The Seafarer, Oxnard, Calif.
- June 14, 28 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
- June 15, 27 — GRAND CAYMAN — 12 days, Sierra Club Outings, San Francisco, Calif.
- June 15, 22, 29 — BELIZE — 7 days, Go Mexico, Inc., Minneapolis, Minn.
- June 16 — COZUMEL/AKUMAL — 8 days, Sunland Int'l Tours, Beverly Hills, Calif.
- June 21 — CAYMAN ISLANDS — 8 days, See & Sea Travel, San Francisco, Calif.
- June 21 — ANDROS, BAHAMAS — 7 days, Fred Calhoun, Underwater Safaris, Boston, Mass.
- June 23 — BIMINI — 7 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- July 3, 10, 17, 24, 31 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
- July 4, 11, 18, 25 — BONAIRE — 8 days, Lisind Int'l, New York, N.Y.
- July 4 — COZUMEL — 8 days, Sunland Int'l Tours, Beverly Hills, Calif.
- July 5 — COZUMEL — 8 days, John Reseck, See & Sea Travel, San Francisco, Calif.
- July 8, 22 — TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, Virgin Islands
- July 8, 17, 25 — FREEPORT — 7 days, Skeet LaChance, Adv. Cruises, Ft. Lauderdale, Fla.
- July 10 — VIRGIN ISLANDS — 12 days, Sierra Club Outings, San Francisco, Calif.
- July 11 — ROATAN, HONDURAS — 8 days, Sunland Int'l Tours, Beverly Hills, Calif.
- July 12, 26 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
- July 12, 26 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- July 12 — ROATAN — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- July 12 — BONAIRE — 9 days, Hank Ketels, See & Sea Travel, San Francisco, Calif.
- July 13 — COZUMEL — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- July 19 — CAYMAN ISLANDS — 8 days, See & Sea Travel, San Francisco, Calif.
- July 24 — MAUI-LANAI, HAWAII — 12 days, Sierra Club Outings, San Francisco Calif.
- July 27 — BELIZE — 7 days, Go Mexico, Inc., Minneapolis, Minn.
- Aug. 1 — VIRGIN GORDA, V.I. — 12 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Aug. 1, 8, 15, 22, 29 — BONAIRE — 8 days, Lisind Int'l, New York, N.Y.
- Aug. 2, 23 — CAYMAN ISLANDS — 8 days, See & Sea Travel, San Francisco, Calif.

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Dive Tour News



- Aug. 3, 17, 31 — COZUMEL — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- Aug. 4 & 25—COZUMEL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Aug. 5—KONA COAST, HAWAII — 10 days, Sierra Club Outings, San Francisco, Calif.
- Aug. 5, 19—TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, Virgin Islands
- Aug. 7, 14, 21, 28 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
- Aug. 8 — NASSAU — 14 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Aug. 9, 23 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
- Aug. 9 — COZUMEL — 8 days, See & Sea Travel, San Francisco, Calif.
- Aug. 16 — BONAIRE — 9 days, John Kelly, See & Sea Travel, San Francisco, Calif.
- Aug. 16, 30 — SAN ANDRES — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- Aug. 16 — ROATAN — 8 days, Go Mexico, Inc., Minneapolis, Minn.
- Aug. 17 — BAJA CALIFORNIA — 6 days, Sierra Club Outings, San Francisco, Calif.
- Aug. 17, 24, 31 — BELIZE — 7 days, Go Mexico, Inc., Minneapolis, Minn.
- Aug. 21 — HAWAII — 10 days, Arnold Stollar & Roy Damron, UNEXSO, Pompano Beach, Fla.
- Aug. 25 — NASSAU — 7 days, Skeet LaChance, Adventure Cruises, Ft. Lauderdale, Fla.
- Aug. 25—CHINCHORRO REEF—13 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Sept. — LAKE SINOIA, RHODESIA, SOUTH AFRICA — 21 days, Ruth Fry Expeditions, Norristown, Penna.
- Sept. 2, 16, 30 — TORTOLA, BVI — 13 days, Trimarine Boat Co. Ltd., St. Thomas, V.I.
- Sept. 4, 11, 18, 25 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
- Sept. 5, 12, 19, 26—BONAIRE—8 days, Lisind Int'l, New York, N.Y.
- Sept. 5, 15—BIMINI—7 days, Adventure Cruise, Capt. Skeet LaChance, Ft. Lauderdale, Fla.
- Sept. 6, 19 — BAHAMAS — 7 days, Tropic Diving Cruises Inc., Ft. Lauderdale, Fla.
- Sept. 6 — COZUMEL — 8 days, See & Sea Travel, San Francisco, Calif.
- Sept. 6 — CAYMAN/ROATAN — 12 days, See & Sea Travel, San Francisco, Calif.
- Sept. 13—ROATAN—8 days, Go Mexico, Inc., Minneapolis, Minn.
- Sept. 14—COZUMEL—8 days, Go Mexico, Inc., Minneapolis, Minn.
- Sept. 16—CARTAGENA, COLOMBIA—10 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Sept. 20 — BONAIRE — 9 days, See & Sea Travel, San Francisco, Calif.
- Sept. 20—SAN ANDRES—8 days, Go Mexico, Inc., Minneapolis, Minn.
- Sept. 26—COZUMEL—8 days, Sunland Int'l Tours, Beverly Hills, Calif.
- Sept. 28—BELIZE—7 days, Go Mexico, Inc., Minneapolis, Minn.
- Sept. 29—FLORIDA KEYS, KEY LARGO—7 days, Fred Calhoun's U/W Safaris, Boston, Mass.
- Sept. 29—PALM BEACH SHORES—5 days, Fred Calhoun's U/W Safaris, Boston, Mass.
- Oct. 2, 9, 16, 23, 30 — KONA, HAWAII — aboard Fair Wind, See & Sea Travel, San Francisco, Calif.
- Oct. 3, 10, 17, 24, 31—BONAIRE—8 days, Lisind Int'l, New York, N.Y.

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GREENBERG SEMINAR

Jerry Greenberg, expert underwater photographer, is making one of his rare appearances as a teacher of U/W photography at Spanish Bay Reef on Grand Cayman Island. Jerry has designed this course for divers who understand basic photo techniques and have enough experience with U/W equipment to benefit from advanced instruction. Students should come equipped to do their own thing: close-ups, wide-angle work, etc. Greenberg will work with each student helping him squeeze the utmost out of his equipment.

Black and white film will be processed daily at no charge and students are welcome to bring their own color processing kits and utilize the resort darkroom. Professional color processing may be available locally by special arrangement at an extra cost.

Greenberg will be on hand from April 20th until the 30th, 1975. Interested divers are urged to take advantage of his experience, and of the fabulous diving right at the front door, by reserving for the full ten nights. For those with only a week, request course dates, April 20-27.

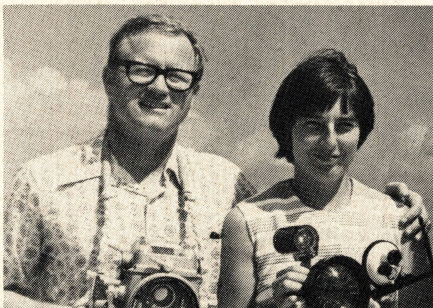
Course cost for the first seven nights is \$394. Additional three nights add \$52/day. These prices include the following: Room (double or triple occupancy), three excellent meals, full day's diving (at least one boat trip per day, sometimes two), government tax, gratuities, and scheduled ground transportation (except taxi from airport on arrival day). While much of the course work will be done on beautiful offshore reefs, within swimming distance, boat trips will take students to other areas for maximum variety, including wrecks, drop-offs, caves, night dives.

For reservations write to Spanish Bay Reef, Box 800, Grand Cayman, BWI. A reservation deposit of \$100 is required. A maximum of 20 students will be accommodated at the course.

CHURCH PHOTO COURSES AT GRAND CAYMAN

Jim and Cathy Church, authors of the Underwater Photography Quick & Easy series in SDM, and the book, *Beginning Underwater Photography*, will again be teaching U/W photography at Spanish Bay Reef Resort, Grand Cayman.

Courses begin on July 26, and August 3, 16 and 24, 1975. Each course is based on two half days (the arrival and departure days), five full days and six nights at Spanish Bay Reef Resort. The total package price of \$395.25 includes the photo course, diving and accommodations.



The course includes lectures and demonstrations, on-the-spot film processing for both color slides and black and white; use of strobe equipment for artificial light assignment; use of numerous lens accessories such as Green Things optical wideners, close-up lenses, extension tubes, filters and viewfinders; and an U/W, Super-8 movie camera. Diving includes boat trips, tanks, air and weight belts for all photo dives. Accommodations include: room with maid service, three excellent meals a day, gratuities and local tax for your stay at the resort and ground transportation required during the course.

With two photo dives scheduled each day, and two instructors, each student receives a maximum of individual help to adjust equipment, find subjects or set up complex multiple lighting. Regular lecture and demonstration sessions are

held each day and learning continues on a person-to-person level throughout the entire course. Evening activities include underwater movies and slide shows by students, instructors and guest photographers, as well as a night photo dive.

Jim and Cathy are accustomed to working with experienced U/W photographers who wish to expand and improve their skills, as well as beginners who will take their first underwater pictures during the course. The Churches are proud of their lasting relationships with past students. Many have returned on successive summers to repeat the course, and several may join Jim and Cathy for their third time this summer. For more information about a fun-packed vacation in the form of an U/W photography course, write directly to: Jim and Cathy Church, P.O. Box 80, Gilroy, CA 95020.

TOBAGO COURSE

Raymond Morrow, PADI Master Instructor 1989 and president of Teach/Tour Diving Company has announced that there will be a PADI Instructor Institute at the Blue Waters Inn, Tobago, West Indies. The course will be held June 22-29, 1975 inclusive.

The total package will include all of the following: instructors course, round trip air fare (New York, Miami or Toronto), motel room for seven nights, all meals, transfers to and from the airport in Tobago, boats, guides, tanks, air, weights and weight belts, hotel taxes, gratuities. The cost for the combination instructor course and diving vacation is \$499. All equipment is furnished except that each candidate must bring his own mask, fins, snorkel, regulator and inflatable vest.

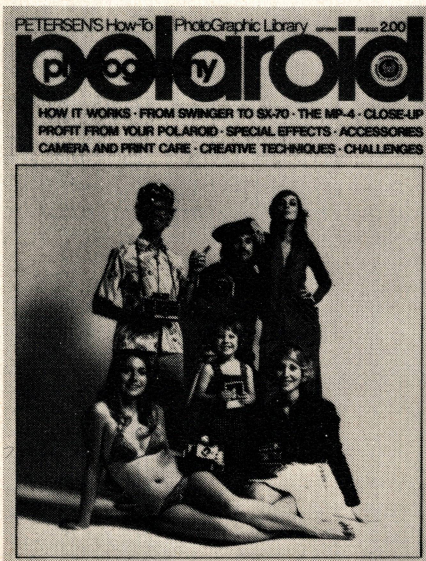
For more information, contact: Teach/Tour Diving Company, P.O. Box 390, Nazareth, Penna, 18064. Phone: (215) 759-6882.

SANTO DOMINGO DIVE

Aquatic Centers International Divers has opened in the Dominican Republic, employing three PADI instructors and two assistant instructors. The facility is equipped with an Inner Space Research 15 cfm, 5000 psi compressor, and maintains 40 sets of masks, fins and snorkels, 30 U.S. Divers aluminum 3000 psi tanks equipped with combination submersible pressure gauge and depth gauge, and 20 Calypso J regulators for guest rental. Weights, weight belts, decompression meters, and underwater lights and other gear are also available on a rental basis.

One Mark V Zodiac with twin 35 hp Chryslers can take 12 divers and equipment to dive along the many beautiful coral reefs in the area. The ACID dive guides, known locally as reefers, promise to make your trip worthwhile. For more information contact: Aquatic Centers International Divers, Max. Henrique Urena #89 (Ens. Piantini), Santo Domingo, Dominican Republic.

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Unlock the creative potential of your Polaroid camera with **Petersen's GUIDE TO POLAROID PHOTOGRAPHY**. Written by photo expert Kalton C. Lahue, it's the complete handbook for this unique photo medium. All of the popular Polaroid models are examined in detail, with individual chapters covering the SX-70, MP-4, and the Model 195. In addition to professional advice for getting the most from your camera, there's a complete rundown on all of the various types of Polaroid film. A special chapter presents the full line of available attachments and outlines procedures for their most effective use. Other topics of interest include a brief history of the Polaroid Land Camera, an explanation of the Polaroid process, caring for your camera and prints, and many more. If you own or plan to buy a Polaroid camera, this **80 PAGE** book is for you!

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THE SUPER RESORT

Mauna Kea Beach Hotel, on the big island of Hawaii, was rated the "greatest resort hotel on earth" by Esquire Magazine. Travel authority Frances Kol-tun said, on NBC Monitor, "It is, in fact, the super resort hotel of the world." And now, Mauna Kea has Mark and Jean Murray and Tom Adams — and scuba diving. Mark and Tom are NAUI instructors. Jean is the first New Zealander to hold a U.S. Coast Guard Captain's license.

The Murray's 37-foot sloop-rigged catamaran, *Kamehameha*, is based at Mauna Kea, just a short sail to the many nearby diving spots. *Kamehameha* is Coast Guard inspected and certified for 20 passengers, and will handle a dozen divers and their gear comfortably. They also use a 16-foot Boston Whaler with a 65 horsepower Johnson, which can zip out to the reefs in a hurry. Their 9 cfm Ingersoll Rand compressor, twelve complete sets of diving gear, 25 sets of snorkeling gear, and 25 tanks with K valves round out the equipment list.

The Murrays offer a six-hour introduction course to scuba at \$50 per course; a two to two-and a half hour snorkeling and scuba trip to Puako reef or to Mahu Kona — where divers prow through the wreckage of old sailing ships, at \$10 for snorkelers and \$20 for scuba divers; an afternoon sail, complete with beer and soft drinks, for \$10 per person; and a sunset cocktail sail with an open bar, hord'oeuvres (and incomparable Pacific sunsets), a bargain at \$13 per person.

Want to see garden eels? They're at Puako Reef — at 60 feet, along with caves, tunnels, arches, and marine life of all kinds. How about the large fish — ulua, muu, ahi, the kind you don't find at home? Then it's Mahu Kona where the visibility is in the 150-foot range. Spear-fishing is prohibited.

While the diving is great at Mauna Kea, so is the golf, and the tennis, and the food. Tennis buffs have nine all-weather courts and a pro shop. Golfers have an 18-hole championship course designed by Robert Trent Jones, and a pro shop.

Bring the kids! During their non-diving hours they can join in the fun with Mauna Kea's free Children's Day Camp. Trained counselors keep children from five to thirteen years old busy and amused from 9 a.m. to 4 p.m. and from 6:30 to 9:30 p.m. Camp operates every-day from mid-June to Labor Day and during Christmas and Easter vacations.

For reservations and further information, you can contact your travel agent, write to the hotel direct (Mauna Kea Beach Hotel, P.O. Box 218, Kamuela, Hawaii 96743), contact Mauna Kea's Western Regional Sales Manager, Jack Smart (Suite 300, 8929 Wilshire Blvd., Beverly Hills, Ca. 90211, telephone, 213-652-6747), or contact the Loew's Reservations Office.

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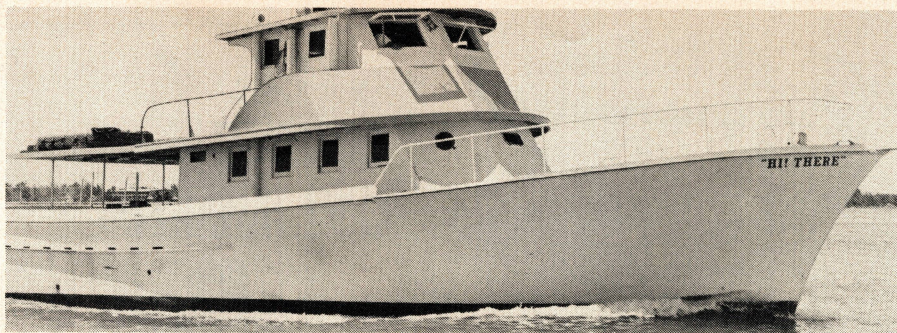
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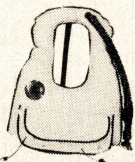
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YMCA Instructor Institute, Tulsa, Oklahoma. (Contact: Ray Anderson, 1724 Elm, Lawton, Oklahoma 73501)

April 5-12

PADI Instructor Training Course, Nassau, Bahamas. (Contact: Fran Ballard, East Bay St., Box N-1658, Nassau, Bahamas)

April 5-6; May 10-11; June 7-8

YMCA Scuba Instructor Institute, Chicago, Ill. (Contact: Frank Van Santen, 525 Dara James Rd., Des Plaines, Ill.)

April 18-20

NAUI-YMCA cross-over certification, Chicago, Ill. (Contact: Jay Hytone, 1702 Keo Way, Des Moines, Ia. 50314)

April 19 — June 15

PADI Instructor Training Course, Boston, alternate weekends. (Contact: Phil Holt, Dolliver's Neck, P.O. Box 216, Gloucester, Mass. 01930)

April 19

YMCA Scuba Instructor Institute, New England. (Contact: Walt Hornberger, 7161 Spire Falls Rd., Gansevoort, N.Y. 12831). Pre-testing Feb. 22.

April 25-27; May 3-4 & 10-11

PADI Instructor Training Course, Chicago. (Contact: Ralph D. Erickson, 6033 N. Sheridan Rd., Chicago, Ill.)

April 26-27 (first of five weekends)

NAUI Scuba Instructor Certification, Rockport, Mass. (Contact: NAUI North Atlantic Branch, Box 291, Back Bay Annex, Boston, Mass. 02117)

May 9-11

YMCA Instructor Institute, Bethlehem, Pa. (Contact: Stephen Hardick, Garden State Underwater Recovery Unit, P.O. Box 404, Milford, N.J. 08848)

May 17-18, June 21-22, July 19-20

YMCA Instructor Institute, Des Moines, Iowa. (Contact: Jay Hytone, 1702 Keo Way, Des Moines, Ia. 50314)

May 24-31

PADI Instructor Training Course, Medford, Ore. (Contact: Bud Higdon, 1616 Corona, Medford, Ore. 92501)

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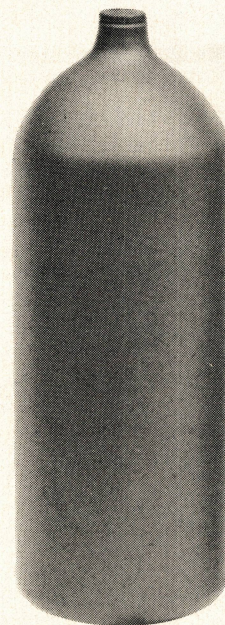
June, July, August

YMCA Scuba Instructor Institute, Little Rock, Ark. (Contact: Glenn Galtere, 2806 Harrisburg Rd., Jonesboro, Ark. 72401)

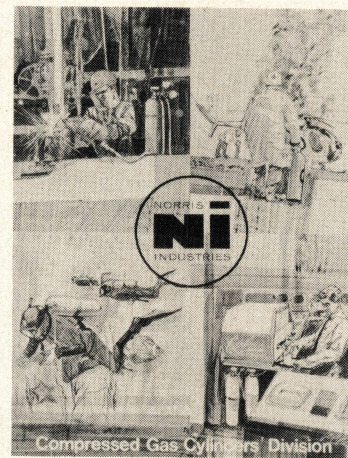
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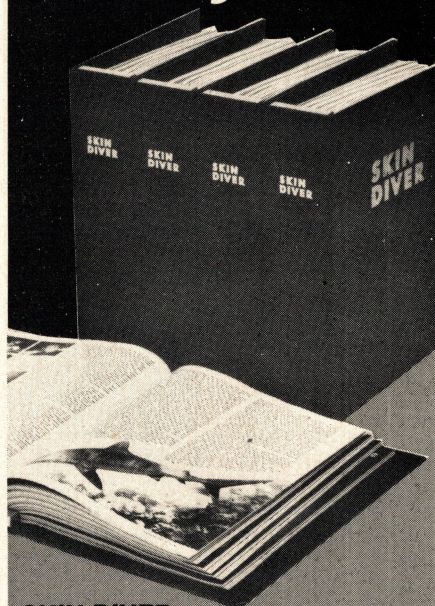


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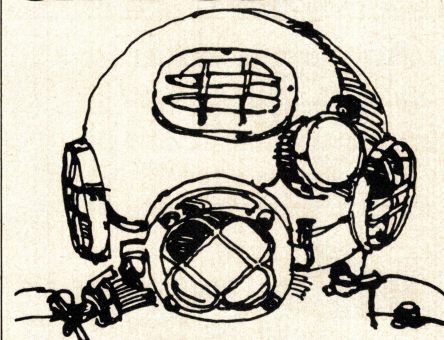
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- June 7-8, 14-15, 21-22
PADI Instructor Training Course, Terre Haute, Ind. (Contact: Duane L. Barrows, Indiana State University, Athletic Dept., Terre Haute, Ind. 47809)
- June 13-15, 27-29
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- June 14-21
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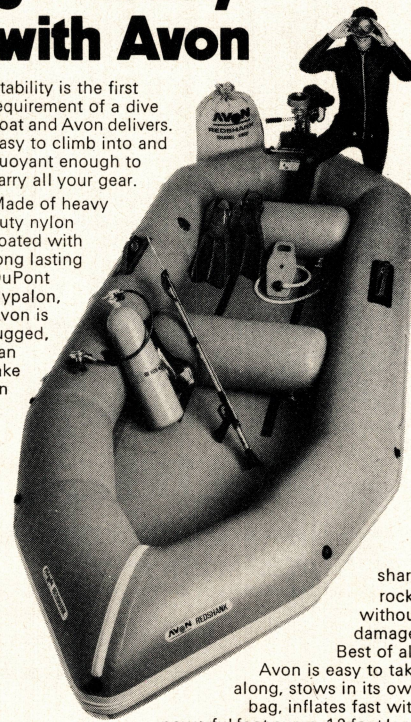
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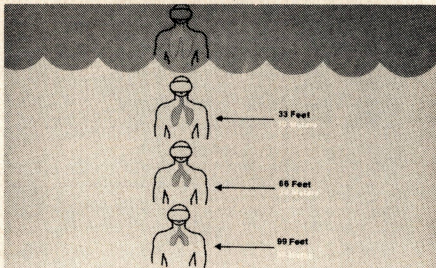
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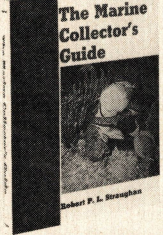
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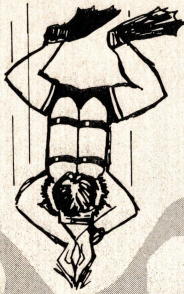
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U/W SOCIETY OF AMERICA WHAT IT IS AND DOES

BY HARRY SHANKS

The Underwater Society of America is an organization designed to represent all divers. Its goals are to amplify and implement the divers needs and wants. These presently are in the areas of insurance, legislation, competitions, environment protection, and awards recognizing those leaders of our underwater world. The membership is made up of skin and scuba divers from all 50 states, the Virgin Islands, and other U.S. territories. It is a not-for-profit corporation registered in Rhode Island since 1965.

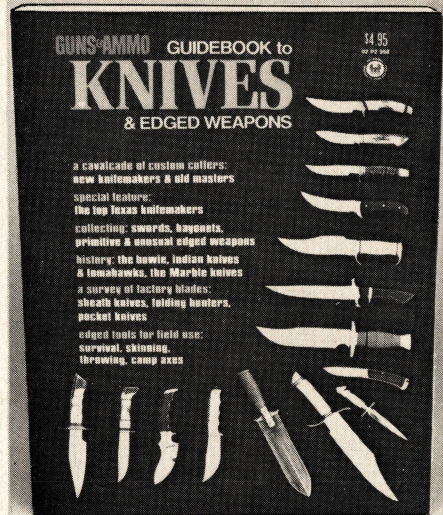
The structure of the Society is formed by diving councils and independent divers whose representatives sit as the Board of Governors. The councils are made up of dive clubs, composed of members from geographical regions or areas. A council must be representative of the majority of the divers from that area. Councils usually represent the clubs on a statewide basis, but in some cases several states are in a council. In one or two cases the council represents a metropolitan area due to the large population of clubs. The independents are those individuals or clubs who are not members of a council and are represented on the Board of Governors, with equal voting privileges, by the vice-president of the Society.

Members of the Board of Governors are the elected representatives of the divers who comprise the membership. They conduct the Society's business at their annual meeting. The meeting was in Houston in 1973 at an Underwater Seminar and Film Festival hosted by the Gulf Coast Council. The meeting in 1974 was held in Chicago prior to the Our World Underwater conference. It is at this annual meeting that the Officers of the Society are elected. Their responsibility is to carry on the work of the Society between the designated meetings. The officers of the Society are: Michael Wagner, President; Ken Mark, Vice President; Howard Trowbridge, Treasurer; and Van Buskirk, Secretary. They comprise the Executive Committee.

Only one paid employee is on the Society's budget, the Executive Secretary. Art Ulley is the Executive Secretary and maintains the office in Ambler, Pennsylvania 19002. Here the communications of the Society is conducted, the records kept and the permanent address maintained. The heart of the Society is its programs which represent the membership. The Directors of these programs are appointed by the President and Executive Committee. Their diligent efforts to seek out the most talented and capable individuals to handle these

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programs is a never ending task. The responsibility of these directors is directly to the membership, for it is their programs that they must carry out. To better coordinate these programs, the Executive Committee has appointed an overall Administrative Director of Programs, Harry Shanks, member of the Board of Directors, representing the Chicago YMCA Metro Council. The Directors are: Charles Atchison, Scuba Director; Janice Barnes, Legislation Director; John McAniff, Safety Director; Howard Ring, Training Director; Tom Hillier, Convention Director; Bill Barada, Environmental Director; Bud Edwards, Divers Against Pollution Director; Ron Schilke, Membership Director; Dean DelBene, Insurance Director; Harry Shanks, Awards Director; Bob Donnell, Skin Diving Director; Mary Edith Lillis, Historical Director; George Bond (Capt.), Rep. to CMAS. International Federation; Jim McMahan, Rep. to the President's Council on Physical Fitness.

Key programs recently completed were the new divers insurance, included with the membership dues, of \$500.00 Accidental Death Benefit for any reason and \$2000.00 if while scuba diving and the recognition of scuba diving as a safe and regulated sport by the President's Council on Physical Fitness.

The responsibility of the Society is to stand in the forefront of any attack on the diver, his freedom and his environment. In this regard it is recognized by the U.S. Government as the only organization that represents the "citizen" diver. In addition, a simple request for pending legislation, possibly affecting the diver, was quickly answered by almost every state legislature in the country — incidentally, with requests for help in questions relating to the diver. In recent years the Society has entered into "diver or anti-diver" legislation in Illinois, New York and Oregon where all such legislation was either defeated or re-written by information the Society supplied.

Simply stated, the Society is not affiliated with any certification agency but recognizes any agency of national scope that fulfills the Z - 86 requisites, nor is it connected with any dive equipment manufacturer or retailer. It represents only the diver but works with all of the above in the interest of the diver for the benefit of his sport.

Membership in the Society does not include diver information periodicals and underwater seminars that are so well handled by diver education agencies and groups. Instead it includes representation in the only nationally and internationally recognized body that speaks for the diver. It is your only representative — your dues are your vote. Membership costs \$3.00 as a council member and \$5.00 as an independent. For more information write Underwater Society, Ambler, Pa. 19002.

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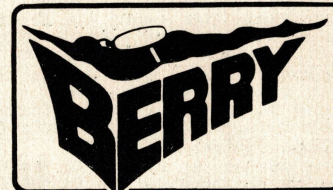
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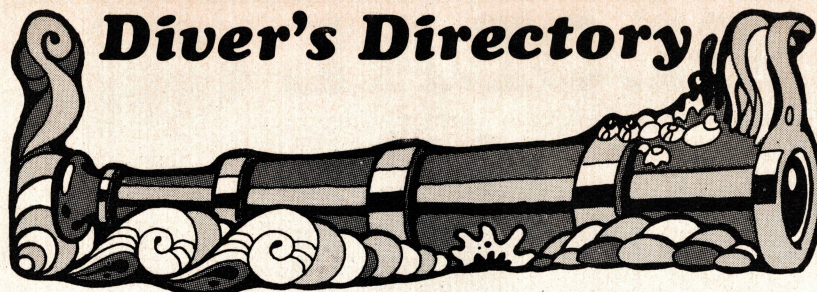
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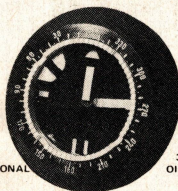
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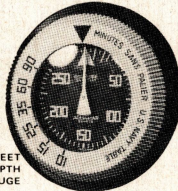
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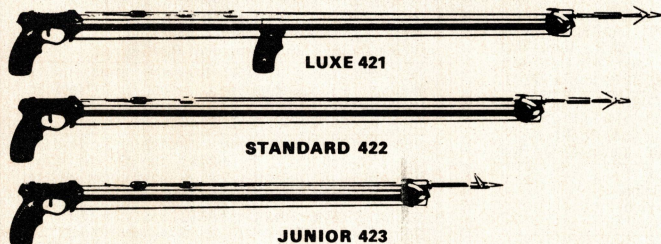


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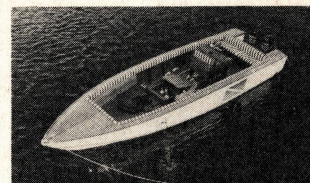
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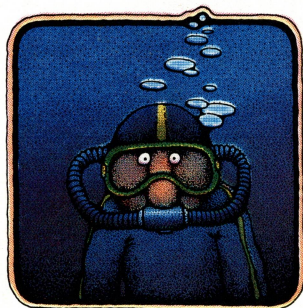
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Notwithstanding, a lot of people look on strobes as just another unnecessary luxury—more of the same gadgetry that afflicts land photography.

Not so. Below about 10 feet, the electronic strobe unit is an absolute necessity. Here are the reasons:

1. Light loss.

Even in very clear water, the light loss can amount to several f-stops for each five feet of depth. Without a strobe, the lens opening must be very large to gather enough light for the shot. And obviously as you go deeper, you reach a point

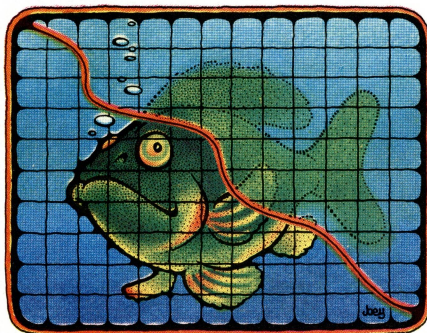


where there is no light to gather.

2. Depth of field.

Given that sufficient light can be gathered with a large lens opening, another problem comes up. As the lens aperture increases, the depth of field becomes very shallow and focusing very critical. Especially when you and everything else keeps moving around.

To make it worse, water reduces the lens' angle of view by about 25 percent. This makes a normal lens



act more like a telephoto lens with still more depth of field loss. So focusing becomes even more critical.

Add a strobe, however, and the problem disappears—more light means a smaller lens aperture. Therefore, the depth of field is restored and the tolerance on focusing is much broader.

3. Color rendition.

This is probably the biggest problem the underwater lensman faces. Water acts as a progressive filter, absorbing first the long red light waves, then the orange, yellow and green, in that order. At depths of 20-30 feet, only the short blue wavelengths survive to produce the boringly familiar monochromatic photos characteristic of non-strobe shots.

But with a strobe flash, you carry your own light with you—and all of the colors that are supposed to be in the picture.

What does it cost?

This question is practically academic since professional color photography without a strobe is virtually impossible in all but the shallowest water. On the other hand, the price of a powerful strobe can get you in over your head in a hurry.

So AMF Swimaster has developed a compact, low-cost strobe unit that performs like a high-powered, high-priced strobe.

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Though smaller in power, the Aqualume I provides light intensity equal to more expensive units rated up to 100-watt-seconds. This is accomplished by narrowing the light beam from the usual 90-degrees to 60-degrees (measured diagonally) to concentrate the light in the camera's field of view. You get bright edge-to-edge illumination even with wide-angle lenses to 28 mm.

On top of that there's a specially-designed xenon flash tube that's color balanced for all standard color print and slide films. The result is brilliant, true-to-life color that will positively amaze you.

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